**s aqar T vel os ganaT l ebi s d a mec ni er ebi s s ami ni s t r o s aqar T vel os saxel mwi f o sas of l o sameur neo uni ver s i t et i**

**z ai r a t yebuCava, c o t ne s amad aSvi l i , gi vi c agur i S vi l i , al eqs and r e gaT enaZe**

**soflis meurneobis safuZvlebi I nawili**

# Tbilisi 2008 weli

saxelomZRvanelo ganxiluli da

rekomendebulia gamosacemad agr onomi ul i f akul t et i s agroteqnologiis departamentis mier (oqmi # 04, 06, 2008 wel i .)

**recezentebi: prof. i .z ed geni Ze pr of . i . saaT aSvi l i as o c . pr of . n. maWavar i ani**

redaqtori: **asoc. prof. a.TxeliZe**

saxelmZRvaneloSi ganxilulia niadagTmcodneobis, agroqimiis safuZvlebi. miwaTnoqmedebis

ZiriTadi sakiTxebidan ganxilulia sarevelebis winaaRmdeg brZolis RonisZiebebi, Teslbrunvebis SemoReba, daproeqteba aTviseba da misi mniSvneloba mosavlianobis gazrdaSi. gaanalizebulia eroziis sawinaaRmdego RonisZiebebi. saxnavi miwebis racionaluri gamoyenebis, niadagis nayof i er ebi s amaRl ebi sa da ekl ol ogi ur aT suf T a pr od uqc i i s mi Rebi s Roni sZi ebebi .

saxelmZrvanelo gaTvaliswinebulia ekonomikur-humanitaruli, sainJinro da agronomiuli specialobis bakalavrebis, magistrebis da doqtorantebisaTvis. wigni sainteresoa soflis meur neobaSi momuSave spec i al i st ebi saT vi s d a ker Zo f er mer ebi sd aT vi s .

I SBN 5-8120-0122-7. © s aqar T vel o s sas o f l o s ameur neo

uni ver si t et i 2008 w

# Sesavali

soflis meurneobis safuZvlebi kompleqsuri sagania, romelSic gaerTianebulia agronomiuli mecnierebis TiTqmis yvela dargi: niadagmcodneoba, agroqimia, miwaTmoqmedeba, melioraciuli miwaTmoqmedeba, memcenareoba, s akvebwar mo eba, mebo s t neo ba, mevenaxeoba, mexileoba. gamomdinare aqedan TviT CamonaTvalic imaze miuTiTebs, rom sagani maStaburia da koompleqsuri Sinaarsisaa. bunebrivia, am sagnis daufleba da miRebuli codnis praqtikuli gamoyeneba sasoflo-sameurneo kulturebi s mo s avl i ano bi s gad i d ebi s r eal ur i gar ant i a i qneba.

aRniSnuli kompleqsuri sagani gamosacemad or wignad momzadda. pirveli wignSi Sevida: niadagmcodneoba, agroqimia da miwaTmoqmedeba, xolo meoreSi, memcenareoba, mebo s t neo ba, mevenaxeo ba d a mexi l eo ba.

bolo wlebSi agrarul dargSi radikaluri cvlilebebi moxda, miwis umetesi nawili saxelmwifo sakuTrebidan kerZo seqtorSi gadavida, amitom mosaxleobis sasoflo-sameurneo produqtebiT momaragebac kerZo mflobelis movaleobad iqca. aqedan gamomdinare sruliad bunebrivad daisva sakiTxi soflad fermeruli meur neo bi s mosawyobad. fermerul meurneobaSi dasaqmebuli pirovneba ki farTo profilis specialisti unda iyos da Tanabrad unda flobdes agraruli dargis yvela sferos, r o mel sac am s agni s s wavl eba i T val i s wi nebs .

aR sani S navi a, rom agronomiis safuZvlebis kursis daufleba did samsaxurs gamoiwvevs ara marto studentebs. aramed yvela pirovnebas visac gadawyvetili aqvs agr ar ul i d ar gS i d as aqmeba d a mo R vaweo ba.

**ni ad agi , r o go r c mc enar i s ganvi T ar ebi s ar e d a s of l i s meur neo bi s war mo ebi s**

# ZiriTadi saS ual eba

dedamiwis garegan f xvi er nawi l s , romelsac unari aqvs daakmayofilos mcenareTa

da masSi mosaxle cocxali organizmTa moTxovnileba sasicocxlo pi r o bebi T -ni ad agi ewo d eba.

niadagmcodneoba swavlobs niadags, rogorc bunebriv sxeuls da sawarmoo saSualebas. niadagis warmonaqmnis, ganviTarebis, ganlagebis kanonzomierebas, nayo f i er ebi s T vi s ebas d a bunebi s Zal ebT an ur T i er T o bi s kavS i r s .

bunebis sawarmoo ZalTa Soris, romelsac kavSiri aqvs miwaTmoqmedebasTan erT-er T i

pirveli da umTavresi adgili miekuTvneba niadags. niadagi, soflis meurneobis ZiriTadi sawarmoo saSualebaa, romelic mcenares amaragebs wyliTa da masSi gaxsnili sakvebi elementebiT. niadagi aris saSualeba kulturul mcenareTa zrda-ganvi T ar ebi s f aqt o r ebi s r egul i r ebi saT vi s , r o mel i c uz r unvel yo f s sas o f l o -sameur neo kul t ur ebi s uxvi d a myar i mo s avl i s mi R ebas .

niadags ganuzomeli saxalxo- sameurneo mniSvneloba aqvs imdenad ramdenadac mas

axas i aT ebs nayo f i er ebi s T vi s eba. e.i . unar i aqvs war mo qmnas mc enar eul i mo saval i .

niadagis Sesaxeb T avi s uf al ganmartebas iZleva v. r . viliamsi-“ roca Cven vlaparakobT niadagze, vgulisxmobT dedamiwis (xmeleTis) zeda horizonts, romelsac aqvs unar i mc enar eT a mo s aval i war mo qmnas .” cneba niadagsa da mis nayofierebaze ganuyofelia. mcenaris sasicocxlo miwieri faqtorebiT ama Tu im doniT dakmayofilebis unars niadagis nayofiereba ewodeba, r i T ac i gi gans xvavd eba sxva bunebi s s xeul ebi s agan.

dedaqanisgan mwvane mcenaris saSualebiT warmoebs mineraluri nivTierebis

gad ayvana o r ganul ni vT i er ebaS i .

nayo f i er eba sxvadasxva saxisaa; pirvelyovl i sa nayofiereba sruliad ucvleli niadagis bunebrivi nayofierebaa. rodesac adamianis zemoqmedebiT mosavlis misaRebad Segvaqvs, s as uqebi , vr wyavT , vawar mo ebT d aS r o bi T d aS r o bi T R o ni s Zi ebebs d a nawi l o br i v vcvliT niadagis bunebriv Tvisebebs, vqmniT niadagis ekonomikur an efeqtur nayofierebas. **niadagis warmoqmna da ganviTareba.** niadagwarmoqmnel faqtorebs miekuTvneba: bunebrivi faqtorebidan:1. dedaqani, 2. klimati, 3. mc enar euloba da cocxali organizmebi, 4. adgilmdebareobis reliefi, 5. qveynis xnovaneba, 6. da ad ami ani s s ameur neo s aqmi ano ba.

ni ad agwar mo qmni s pr o c es i s ar s s war mo ad gens ni ad ags a d a mas z e mc xo vr eb mc enar eul organizmebs Soris nivTierebaTa mudmivi cvla. mcenare niadagidan iRebs mineralur nivTierebebs, xolo sikvdilis Semdeg isev ubrunebs organuli nivTierebis saxiT, fesvebis Rero-foTlebisa da sxva narCenebis gziT. organuli nivTierebani mikroorganizmebisgan ganicdian daSlas. mineraluri marilebis saxiT, romelTac wyalSi xsnadobis unari aqvT. am mineralur marilebs niadagidan iRebs mc enar e d a i yenebs s akveb el ement ebad .

niadagsa da mcenares Soris am ur T i er T o bas nivTierebaTa biologiuri wrebrunva

ewo d eba.

niadagis warmoqmnis materialur safuZvels warmoadgens qanebi. gamofitvis qerqs, romelzedac mimdinareobs niadagis warmoqmnis procesi niadagwarmomqmneli deda qani ewodeba. aRniSnuli qanebi Seicaven mcenarisaTvis aucilebel zogierT qimiur elementebs, romelTa umetesi nawili mcenarisaTvis SeuTvisebelia. yvela qani iSleba da icvleba misi qimiuri Sedgeniloba da fizikuri Tvisebebi. am movlenas gamofitva ewodeba. gamofitvis Sedegad naSali qani niadagis mineralur nawilebad iqceva, amrigad niadagis mineraluri nawilis Sedgeniloba damokidebulia qanis Sedgenilobaze, mi s i gamofitvis xasiaTsa da intensiobaze. gamo f i t vi s bunebriv f aqt o r ebs mi ekuT vneba wyal i , t emper at ur a, haer i d a sxva mi kr o r gani z mebi .

arCeven gamofitvis sam tips: f i z i kur s meqani kur i , qi mi ur i da biologiurs. f i z i kur s meqanikuri gamofitvaintensiurad mimdinareobs udabnosa da naxevarudabnoSi, agreTve maRalmTian zinaSi yinviTi gamofitvis procesebi. qimiuri gamofitva ki subtropikul mxar eS i .

fizikuri anu meqanikuri gamofitva iseTi procesia, rodesac qanebi iSleba wvril namsxvrevebad da masaSi ar xdeba qimiuri cvlilebebi. xolo qimiuri gamofitva iseTi proces i a r o d esac qanS i mi md i nar eo bs qi mi ur i c vl i l ebebi .

**qanis gamofitva**. qanis gamofitva (daSla) rTuli procesia da mimdinareobs fizikuri, qimiuri da biologiuri movlenebis saxiT. mTis qanebis daSlis es procesebi erTdroulad mimdinareoben, magram SeiZleba Warbobdes romelime maTgani, amitom, imis mixedviT, TuU romeli dominantobs am procesTagan pirobiT ganasxvaveben gamofitvis Semdeg saxeebs: 1) meqanikur anu fizikur gamofitvas, 2) qimiur gamofitvas, 3) bi o l o gi ur gamo f i t vas.

**meqanikur anu fizikur** gamofitvis Sedegad qani ganicdis meqanikur daSla-

daqucmacebas sxvadasxva zomis nawilebad, magram qimiuri Sedgeniloba Seucvleli rCeba, qanebis fizikur gamofitvas temperaturis c val ebad o bas , wylis gayinva, yinvebis, gamd i nar e wyl i s d a qar i s mo qmed eba i wvevs .

**qimiuri gamofitvis** Sedegad qani icvlis Tavis qimiur Sedgenilobas da fizikur Tvisebebs. qimiuri gamofitvis Sedegad warmoiqmneba qanis Semadgenel nivTierebebTan S ed ar ebi T T vi s o br i vad gans xvavebul i pr o d uqt ebi – qani i c vl i s qi mi ur md go mar eo bas . qimiuri gamofitva miT intensiuris rac Warbadaa gaxsnili wyalSi naxSirorJangi da

maR l i a t emper at ur a.

**biologiuri gamofitva.** biologiuri gamofitva mimdinareobs cocxali organizmebis meSveobiT da Tavisi xasiaTiT SeiZleba iyos qimiuri da fizikuri. biologiur gamofitvaSi monawileoben rogorc umartivesi mikroorganizmebi, ise liqenebi, wyal mc enar eebi d a umaR l es saf exur z e md go mi mwvane mc enar eebi .

rogori xangrZlivi da Rrmac arunda iyos gamofitva, mas ar SeuZlia Seqmnas da

daagrovos mcenaris arsebobisaTvis aucilebeli sakvebi nivTierebebi. e. i. mas ar

SuZlia qani gardaqmnas niadagad. gamofitvis Sedegad warmoqmnili advilad xsnadi SenaerTebi swrafad gamoirecxebian qanidan atmosferuli nal eqebi s Sedegad. garda amisa biol o gi ur ad i s eT i mni Svnel o vani el ement i , r o go r i c azotia srulebiT ar Sedis magmur mTis qanis SemcvelobaSi. nacrovani da azotiani sakvebi elementebis niadagwarmomqmnel qanis zeda horizontebSi dagroveba mwvane mcenareTa da mikroorganizmTa cxovelmyofelobis Sedegad xdeba. amitom savsebiT marTebulad miaCniaT, rom niadagwarmoqmnis procesi iwyeba im momentidan, rodesac qanebis gamofitvis produqtebze mcenareuloba da mikroorganizmebi dasaxldebian, amieridan dedaqani xdeba niadagad anu bunebr i v sxeulad, misTvis damaxasiaTebeli yvelaze mni S vnel o vani T vi s ebebi T -nayo f i er ebi T .

**klimati.** klimati niadagwarmoqmnis procesebze gavlenas axdens. klimatTan aris dakavSirebuli niadagSi tenisa da siTbos miwodeba, xolo isini Tavis mxriv gansaz Rvr aven mcenareulobis xasiaTs da niadagSi mimdinare mikrobiologiuri pr o c es ebi s i nt ens i vo bas .

klimati did gavlenas axdens niadagi s qimiur, fizikur da fizikur-qi mi ur

pr o c es ebz e. sxvadasxva klimatur zonebSi niadagwarmomqmneli procesebi gansxvavebulad mimdinareoben, rac iwvevs ama Tu im zonisaTvis damaxasiaTebel ni ad agebi s war mo qmnas .

**mcenareuloba da cocxali organizmebi.**  mcenareuloba da cocxali organizmebi niadagwarmoqmnis ganmsazRvreli faqtoria. masTan dakavSirebulia niadagis zeda fenebSi kvebis elementebis dagroveba, agreTve humusis-niadagis nayofierebis mTavari wyaros warmoqmna. mcenareuli masis narCenebi mravali niadaguri mikroorganizmis aucilebeli sakvebi masala da ganviTarebis umniSvnelovanesi pirobaa. mcenareebi fesvis gamonayofiT aZliereben Znelad xsnadi mineraluri nivTierebebis SesaTvisebel mdgomareobaSi gadasvlas da amiT xels uwyoben advilad SesaTvisebeli SenaerTebis war mo qmnas . niadagwarmoqmnaSi mniSvnelovani roli ekuTvnis cxovelur organizmebsac: umartivesebs, uxerxemloebsa da mTxrel xerxemlianebs. uxerxemloebidan yvelaze met gavlenas axdenen Wiayelebi, romlebic TavianT organizmSi 10 tonamde niadagis masas atareben TiToeul heqtarze. amitom Wiayelebi niadagis nayofierebis erT-erTi biologiuri maCvenebelia, xerxemliani cxovelebi (Txunelebi, Triebi, zazunebi, miwis kurdRlebi, memindvriebi) Txrian soroebs, ureven organul nivTierebebs mineralurSi, S esamCnevad z r d i an niadagis, wylis da haeris gamtarianobas, rac xels uwyobs mc enar eul i nar Cenebi s mi ner al i z ac i as .

**reliefi.** reliefi, rogorc niadagwarmoqmneli faqtori, rogorc wesi gansazRvravs mzis radiaciisa da tenis S ER wevad o bi s xas i aT s . ar Ceven makro da mikro reliefs. makro reliefi adgilis vrceli teritoriis saerTo saxes warmoadgens, zogjer mniSvnelovani vertikaluri ryevadobiT. mikro reliefs. makr o r el i ef i adgilis vrceli teritoriis saerTo saxes warmoadgens, zogjer mniSvnelovani vrceli t er i t o r i i s saerTo saxes warmoadgens, zogjer mniSvnelovani vertikaluri ryevadobiT. makro reliefi ki mcire nakveTebis zedapiris formaa Tavisi us wo r mas wo r o bi T a d a s i maRl eT a c val ebad o bi T .

reliefis elementebidan didi mniSvneloba aqvs reliefis formebs, simaRles z Rvi s

d o ni d an, daqanebas da eqs po z i c i as . formis mixedviT ZiriTadad ganasxvaveben vake da mTian reliefs. vake reliefi SeiZleba iyos z ed api r ul ad s wo r i , an sustad daxrili talRovani, magram masze yovelTvis aris gamosaxuli mikroreliefi. mTiani reliefis roli niadagwarmoqmnaSi ufro rTulia, radganac reliefis am formas axasaTebs sxvadasxva simaRleze mdebareoba zRvis donidan, qanobi, konfiguracia da eqspozicia, ris gamoc ufro mkafiod aris gamosaxuli da mravalmxrivia mTiani reliefis gavlena ni ad agwar mo qmni s pr o c es ebz e.

**niadagis xnovaneba.** niadagis xnovaneba–niadagwarmoqmnis bunebrivad mimdinare procesi droSi vlindeba. periods, niadagis warmoqmnis dawyebidan Tanamedroveobamde, niadagis xnovaneba ewodeba. gasagebia, rom maTi warmoqmna zogan adre daiwyo, zogan gvian. rogorc wesi, Savmiwebi ufro xnovanebi arian, isini gamyinvarebis periodidan vi T ar d ebi an.

# adamianis sameurneo saqmianobis roli niadagTwarmoqmnis procesSi. mi waT mo qmed eba

warmoiSva uxsovari droidan, roca adamianebi mcenareebis Segrovebidan maT gamravlebaze gadavidnen. am droidan niadagi gaxda Sromis obieqti da warmoebis ZiriTadi saSualeba. niadagze adamianis sawarmoo zemoqmedebis gzebi da saSualebani uaRresad mravalgvaria. niadagis melioracia, meqanikuri damuSaveba, ganoyiereba, mindorsacavi tyis zolebis mowyoba da sxva iseTi RonisZiebebia, romlebsac SeuZliaT Secvalon niadagTwarmomqmneli procesebi da niadagis Tvisebebi. niadagze adamianis dadebiTi moqmedebasTan erTad zogjer adgili aqvs uaryofiT gavlenas, romelsac is xSirad Tavisda uneburad an windauxedaobiT akeTebs. mag. tyeebis gaCexva, t yeebS i xanZris gaCena, niadagebis moxvna ferdobis daqanebis mimarTulebiT da sxva, mTian adgilebSi iwveven eroziuli procesebis ganviTarebas., niadaguri safaris Camorecxvas, hi d r o l o gi ur i r eJ i mi s gauar esebas , vake ad gi l ebi s d aWao bebas d a s xva.

**niadagi-sas of l o -sameurneo warmoebis ZiriTadi sawarmoo saSualeba.** niadagi aris soflis meurneobis warmoebis ZiriTadi da Seucvleli saSualeba, igi erTsa da imave d r o s S r o mi s sagani c ar i s d a S r o mi s s aSual ebac . S r o mi s sagani a i mi t o m, r o m s as o f l o sameurneo kulturebis ukeTesi ganviTarebisaTvis da maRali mosavlis misaRebad vawarmoebT niadagis damuSavebas, melioracias, ganoyierebas da sxva. niadagi S r o mi s saSualebaa imitom, rom mis gareSe SeuZlebelia soflis meurneoba da sasoflos ameur neo pr o d uqc i i s war mo eba.

niadagT warmoqmnis procesSi, romlis mimarTuleba da siCqare bunebrivad mimdinare procesebis zemoqmedebiTa da adamianis sameurneo saqmianobiT gani saz R vr eba, warmoiqmneba da Semdgom ganviTarebas ganicdis. niadagis umniSvnelovanesi Tviseba- nayofierebaa-niadagis unari uzrunvelyos mcenaris moTxovnilebebi wyliT da sakvebi el ement ebi T , Seqmnas Sesabamisi haerovani da Tburi reJimebi da sasoflo-s ameur neo kulturebis mosavali. niadagi rTuli bunebrivi sxeulia, igi warmoebis sxva saSualebebisgan imiT gansxvavdeba, rom gonivruli gamoyenebis pirobebSi xdeba misi nayofierebis gaumjobeseba. amasTan erTad unda avRniSnoT, rom niadags, rogorc bunebriv sxeuls gaaCnia Tavisi istoria, igi isaxeba da viTardeba, mas aqvs Tavisi warsuli, awymo da momavali. misi warmoqmna- rTuli gzaa da damokidebulia garemo pirobebze. amis gamo ekologiuri pirobebis Sesabamisad dedamiwaze gvaqvs niadagis mr aval f er o vneba, r o ml ebi c gansxvavd ebi an er T maneT i sagan mT el i rigi T vi s ebebi T .

niadagi mosavlis safuZvelia, sazogadoebis simdidris wyaroa. saWiroa TvalisCiniviT gavuf r T xi l d eT mas, yoveli Rone vixmaroT misi nayofierebis amaR l ebi s aT vi s.

ni ad agis orgvar nayofierebas arCeven: 1. bunebr i vs , romelic warmoiqmneba da viTardeba bunebriv faqtorTa erToblivi zemoqmedebiT adamianis monawileobis gareSe 2. efeqturs, romelic iqmneba adamianis SromiT da damokidebulia, erTi mxriv, niadagze adamianis sameurneo zemoqmedebis xasiaTiT da, meore mxriv, mecnierebisa da teqnikis ganviTarebis Tanamedrove doniT. efeqturi nayofiereba ganisazRvreba mosayvani sasoflo-s ameur neo kul t ur ebi s mo s avl i s s i d i d i T . niadagis nayofiereba aris niadagis ara myari, aramed mudmivad cvalebadi Tviseba. misi gaumjobeseba SesaZlebelia niadagis damuSavebis wesebis gaumjobesebiT, sasuqebis SetaniT, miwaTmoqmedebis progresuli sistemis danergviT da urTierT So r i s dakavSirebuli sxva RonisZiebebis gatarebiT, SesaZlebeli gaxda niadagis nayofierebis mkveT r i gad i d eba d a mi s saf uZvel z e maRal i d a mz ar d i mo s avl i s mi R eba.

maRali da myari mosavlis miReba SesaZlebelia im pirobiT, Tu mcenare ganviTarebis stadiebis Sesabamisad erTdroulad da maqsimalurad uzrunvelyofili i qneba mi s i s o c o c xl i saT vi s s aWi r o yvel a f aqt o r i T .

# ni ad agi s Sed geni l oba da T vi s ebebi

**ni ad agi s kl as i f i kac i a meqani kur i S ed geni l o bi s mi xed vi T .** ni ad agi s amf az i ani

d i s per s i ul i s xeul i a., i gi S ed geba myar i , T xi er i d a ai r o vani f az i sagan.

niadagis myari (magari) faza sxvadasxva zomis nawilakebisagan anu meqanikuri el ement ebi s agan S ed geba, r ac war mo ad gens f r aqc i aT a er T o bl i o bas .

sxvadasxva zomis fraqciebs gansxvavebuli fizikuri da qimiuri Tviseba aqvT, romlebic did rols asruleben niadagSi mimdinare procesebsa da saboloo jamSi misi nayo f i er ebi s S eqmni s s aqmeS i .

meqanikuri Sedgenilobis mixedviT arCeven qvebs -xirxats da wvrilmiwa nawils. xirxats miekuTvneba nawilakebi, romelTa diametri 1 mm-ze metia, xolo wvrilmiwa agregatebs iseTi, romelTa diametri 1 mm-ze naklebia, 0,01 mm-naklebi fizikuri Tixaa, xo l o 1-0,01 mm z o mi s nawi l akebi f i z i kur i T i xaa.

xirxatiani niadagebi warmoadgens qanebisa da mineralebis namtvrevebs. sxvadasxva niadags xirxatiani fraqciis raodenoba sxvadasxva aqvT. maRali mTis niadagebi baris niadagebT an S ed ar ebi T met i xi r xat i ano bi T gamo i r Ceva.

TiTqmis ar moipoveba iseTi niadagi, romlis meqanikuri Sedgeniloba mxolod erT r o mel i me f r aqc i as S ei c avs .

niadagis meqanikur Sedgenilobazea damokidebuli, STanTqmiTi unarianoba, qimiuri S ed geni l o ba, wylisa da haeris reJimebi niadagis meqanikuri Sedgeniloba gavlenas axdens mis fizikur, fizikur-qimiur Tvisebebze, struqturianobaze, winaRobis Zalaze da sxva. sxvadasxva meqanikuri Sedgenilobis niadagebi sxvadasxva TvisebiT xasiaTdebian. magaliTad Tixiani niadagebi Zneli dasamuSavebelia, Tixnari da silnari niadagebi ki piriqiT, SedarebiT advili. amitom Tixnar niadagebs- mZime meqanikuri Sedgenilobis ni ad agebs uwo d eben, xo l o s i l nar s ms ubuqi S ed geni l o bi s as .

Tixnari niadagebi wyals zedafenebidan s i R r meS i Znelad atareben, silnari da qviSnari niadagebi ki advilad. xirxatiani niadagebi swrafad da metad Tbebian vidre T ixa niadagebi. amitom xirxatian, qviSian niadagebs Tbil niadagebs uwodeben, xolo T i xi ans c i vs .

Tixian niadagebSi Setanili sasuqebi ufro daculia gamorecxvisagan vidre silnari niadagebi. am mizeziTY silnar niadagebSi sasuqebis sruli normiT erTianad S et anas er i d ebi an d a sasuqebi wi l ad o br i vad S eaqvT .

**Nniadagis xvedriTi masa**Nni ad agi s magari fazis xved r i T i mas a aris gar kveul i mo c ul o bi s (1s m3, forebis CauTvlelad) absoluturad mSrali niadagis masa S ef ar d ebul i i mave mo c ul o bi s wyl i s masas T an.

Nni ad agi s mayar i f az i s xved r i T i masa ni ad agi s S ed geni l o bi s er T -er T i maCvenebel i a. cnobilia, rom niadagis mayari nawilebis xvedriTi masa meryeobs 2,3-2,9 farglebSi. rac metia niadagSi mineraluri nivTiereba, miT metia misi xvedriTi masa, da piriqiT, organuli nivTierebis meti raodenoba mis xvedriT masa amcirebs. Aase, magaliTad, t o r f i ani ni ad agi s xved r i T i masa udris 1,8; S avmi wa ni ad agi sa, r o mel i c 10 %-md e humus s Seicavs – 2,35; Tixnarisas – 2,5-2,6; qvi S nar i s as ki - 2,65-2,7.

Nniadagis magari fazis xvedriTi mas a Tu viciT, SegviZlia ukve ramdenadme warmodgena viqonioT niadagis Sedgenilobisa da misi sawarmoo Tvisebebis Sesaxeb. Nniadagis magari fazis xvedriTi mas i s codna saWiroa agreTve niadagis forianobis, aR nago bi s d a saxnavi f eni s mas i s gamo sar kvevad .

**niadagis moculobiTi masa.** Nniadagis moculobiTi masa aris garkveuli moculobis (1 sm3), struqtura dauSleli Senebis haer mSrali niadagis masis Sefardeba imave mo c ul o bi s wyl i s masasaTan.

Nniadagis moculobiTi masa maCvenebelia niadagis aRnagobis, anu simkvrivis da damokidebulia forianobaze, meqanikur Sedgenilobaze, struqturaze, humusis raodenobaze da sxv. amisaTvisaa, rom, Tu viciT niadagis moculobiTi masa, SegviZlia miaxloebiTi warmodgena viqonioT niadagis sawarmoo Rirebulebis \_ mcenareTa sakvebi elementebiT, wyliT, haeriTa da sxvaTa uzrunvelyofis xarisxis Sesaxeb. misi saSualebiT SegviZlia niadagis forianobis da saxnav fenaSi arsebuli wylisa da s akvebi ni vT i er ebi s mar agi s gamo yeneba.

Nni adagis moculobiTi mas is dadgena, marTalia, imave mis moculobis wylis masasaTan SefardebiT warmoebs, magram cnebebi \_ niadagis moculobiTi masa, s t r uqt ur adaurRveveli Senebis niadagisa da niadagis mayari fazis xvedriTi masa \_ forebisa da svrelebis CauTvlelad \_ identuri ar aris. Nniadagis magari fazis xvedriTi masa yovelTvis didia imave niadagis moculobiT mas asTan SedarebiT. Aaseve cnobilia, rom niadagis zeda fenebis moculobiTi masa naklebia misi qveda fenebis mo c ul o bi T masasTan SedarebiT. saxnavi fenis moculobiTi masa 1-dan 1,15-1,20-mde mer yeo bs , qved a f enebi s mo c ul o bi T i masa 1,2-1,6-md e f ar gl ebS i a mo c emul i .

**niadagis forianoba.**Nnidagis forianoba ewodeba garkveuli moculobis niadagSi arsebul erTad aRebul yoveldgvar forebs, Sualedebsa da Rru adgilebs. Nniadagi cnobilia, rogorc forovani sxeuli. Fforebi niadagis meqanikur da struqturul erTeulTa Soris aris moqceuli. aseve cnobilia, rom ramdenadac wvrilmarcvliania struqtura, miT metia misi forianoba, rac meti raodenobiT iqneba niadagSi neSompala, miT metia Sig forebi, nafesvarebi, Wiayelis xvrelebi da sxv. maSasadame, niadagis forianoba damokidebulia mis meqanikur Sedgenilobasa da struqturaze. Aamitomaa, rom sxvadasxva niadags sxvadasxva forianoba axasiaTebs. Aase, magaliTad, Tixiani niadagis f o r i ano ba ufro metia, vidre Tixnarisa da miT ufro qviSnari niadagebisa. qviSnari niadagebis forianoba Tu 30-40 %-is farglebSi meryeobs, Tixnari niadagebSi is 40-50 %, xolo Tixian niadagebSi – 50 % d a met i .

nidagSi saerTo forianobis garda arCeven kapilarulsa da ar akapi l ar ul f o r i ano bas ac . Kkapi l ar ul i f o r i ano ba ar i s ni ad agS i ar s ebul i uwvr i l es i , bewvi sebur i forebi, romelTa SemweobiTac niadagSi wyali qvevidan zeviT moZraobs. danarCeni iqneba arakapilaruli forianoba. kapilaruli da arakapilaruli forinoba did gavlenas axdens niadagis wylier, haerovan, fizikur-meqanikur Tvisebebze, qimiur, bioqimiur procesebze, mcenareTa zrda-ganviTarebaze da sxv. Aamgvarad, niadagis f o r i ano bas d i d i s awar mo o mni S vnel o ba aqvs .

**plastikuroba.** plastikuroba ewodeba niadagisunar s ganicados def o r mi r eba

garegani meqanikuri zemoqmedebiT erTianobis daunawevrianeblad da SeinarCunos mocemuli forma. niadagis plastikuroba damokidebulia meqanikur, mineralogiur, qimiur Sedgenilobaze da gamovlindeba tenianobis gansazRvrul diapazonebSi. mSral da gadaWarbebulad tenian mdgomareobaSi niadagi ar amJRavnebs plastikur o bas . plastikurobas aqvs qveda da zeda zRvari, rac axasiaTebs niadagis gadasvlas erTi konstitenciidan meoreSi. ix cx. #1 dasaxelebul sidides zomaven plastikurobis r i c xvi T . i gi war mo ad gens t eni ano bas S o r i s s xvao bas pl as t i kur o bi s z ed a d a qved a **ni ad agebi s kl as i f i kac i a pl as t i kur obi s mi xed vi T** cxr. # 1

|  |  |  |
| --- | --- | --- |
| klasi | niadagebi | pl as t i kur o bi s r i c xvi |
| **I**  **II**  **III**  **IV** | maRal pl as t i kur i (T i xebi ) pl as t i kur ebi (T i xnar ebi ) s us t ad pl as t i kur ebi (qvi S nar ebi ) ar a pl as t i kur ebi (qvi S ebi ) | 17  17-7  7-0  0 |

zRvars Soris; rac ufro didia mocemuli maCvenebeli, miT ufro plastikuria

niadagi. yovel niadags aqvs tenianobis garkveuli intervali, romlis drosac vlindeba plastikuroba, e.i. plastikurobis sazRvrebi da plastikurobis garkveuli ricxvi. ni ad agebs pl as t i kur o bi s s i d i d i s mi xed vi T yo f en kl as ebad **niadagis webovnebis Tviseba.** webovnebas uwodeben niadagis nawilakebis Tvisebas

gar kveul i t eni ano bi s pi r o bebS i mi ewebo s er T maneT s d a gar eS e s xeul s .

niadagis webovnebas apirobebs meqanikuri Sedgeniloba, tenis raodenoba, STanTqmul fuZeTa Sedgeniloba da sxva. mZime meqanikuri Sedgenilobis niadagebis webovneba gacilebiT didia, vidre msubuqisa. webovnebis Tviseba cvalebadobs tenis raodenobis mixedviT. mSral niadags webovnebis Tviseba ar axasiaTebs. garkveuli farglamde tenis mateba adidebs webovnebas (Semdgom matebas ki Tan mosdevs webovnebis Semcireba). niadagi, romelic STanTqmul fuZeTa Soris Na –s Seicavs, tenian mdgomareobaSi maRali webo vnebi s T vi s ebi T xas i aT d eba.

Nniadagis webo vnebi s didi mniSvneloba aqvs. Mmisi praqtikuli mniSvneloba imaSi mdgomareobs, rom is gavlenas axdens niadagis weviT winaRobaze. magaliTad, adidebs mZime niadagebis weviT winaRobas maRali webovnebis Tvisebis mqone niadagebis weviTi winaRobis Zala didia, xolo optimaluri tenianobis pirobebSi niadagi, webovnebis gamo, agregirebas ganicdis, ris gamoc misi weviTi winaRobis Zala mcirdeba. webovneba izrdeba Zalis im sididiT, romelic saWiroa niadagis Sewebebuli nawilakebis erTmaneTisagan an niadagze miwebebuli gareSe sagnis mosacileblad. webovnebis Zalas gamosaxaven g/sm2 –i T .

**gajirjveba da dajdoma.** niadagis unars datenianebisas gadiddes moculobaSi

gaj i r j veba ewo d eba.

niadagis koloidebs didi mniSvneloba aqvs niadagis gajirjvebaSi, gansakuTrebiT organulebs, romlebic datenianebisas diddeba moculobaSi, xolo mcirdeba gamoSrobisas. qviSiani niadagebi umniSvnelod Seicaven koloidebs, amitomac isini mT l i anad ar j i r j vd ebi an. T i xi ani d a T i xnar i ni ad agebi ki mni S vnel o vnad ac .

roca niadagi moculobaSi iklebs es mis dajdomas niSnavs, romelic wylis aorTqlebiTa da advilad xsnadi marilebis mocilebiT aris gamowveuli. dajdomis sidide damokidebulia datenianebis xarisxze, niadagis meqanikur da mineralur Sedgenilobaze. gajirjvebasa da dajdomasTan dakavSirebuli moculobis cvlilebebi sas ni ad agi s z ed api r i s kd eba (napr al d eba), xel s uwyo bs wyl i s d akar gvas d a mcenareTa fesvTa sistemis dawydomas, es ki Zalian cudad aisaxeba sasoflo sameurneo kul t ur aT a mo savl i ano baz e.

**niadagis simwife,** niadagis simwife aris misi dasamuSaveblad mzadyofna. r o c a niadagi advilad muSavdeba gamwevi Zalis minimaluri daxarjviT da kargad i Sl eba koStebad. fizikur simwifes uwodeben, meqanikuri Sedgenilobis mxriv Tixnari SavmiwebisaTvis fizikuri simwife dgeba zRvruli wyaltevadobis 40-70%- i sas,

T i xnar ebi s aT vi s -50-65%-i sas.

**niadagis bmuloba (simagre.)** ni ad agi s bmul o ba mi s i myar i f az i s S eWi d ul o bi s xar i s xs

gamosaxavs, e.i. gviCvenebs niadagis simagris xarisxs. niadagis simagre gareSe meqani kur i Zal i sad mi wi naR o bi s unar i T i z o meba. niadagis bmulobis unari damokidebulia meqanikur Sedgenilobaze. struqturianobaze, STanTqmul kaTionebze. tenianobaze, meqanikuri elementebisa da s t r uqt ur ul i agr egat ebi s wyo bi s xas i aT z e d a s xva.

niadagis bmuloba agronomiuli TvalsazrisiT mniSvnelovani Tvisebaa. igi gavlenas axdens niadagis weviT winaRobasa da mcenaris dasafesvianeblad saWiro Zalis raodenobaze.

**xvedriTi winaRoba.** xved r i T i wi naR o ba aris Zala, romelic ixarjeba beltis mo s aWr el ad , mis gadasabruneblad da samuSao organoebze xaxunis gadasal axavad . wevis Zal i s s i d i d e (wZ) mo xvni s d r o s gani saz R vr eba kuT r i wi naR o bi T (kg sm/2).

wZ=kw

niadagis kuTri winaRoba meqanikur Sedgenilobaze, fiziko-qimiur Taviseburebasa da t ent evad o baz e d amo ki d ebul ebi T Sead gens 0,2-1,2 kg/sm2-s. niadagebs (qviSiani da qviSnari). yvelaze didi bicobebs, r omlebic Seicaven natriums 20-30%-is zeviT mSTanTqav ko mpl eqs S i . kuTr winaRobaze arsebiT gavlenas axdens datenianebuli niadagebi . maqsimaluri kuTri winaRoba xdeba Wknobis koeficientTan axlo mdgomi tenianobis dros.

sasoflo – sameurneo kulturebis movla moyvanis dros kuTri winaRoba mniSvnelovnad icvleba, saToxni kulturebis qveS is mcirea, vidre marcvleul da sakveb balaxebSi. kuTri winaRobis sidide damokidebulia niadagis dasarevlianebaze, gansakuT r ebi T f es vnayr i ani sar evel ebi T .

# Nniadagis s t r uqt ur a d a mi s i s i mt kice

Nniadagis unars \_ daiSalos sxvadasxva zomisa da formis agregatebad \_ niadagis struqturianoba ewodeba. Nniadagis struqturis wylis damSleli moqmedebisadmi winaaRmdegobis unars simtkice ewodeba, rasac didi praqtikuli mniSvneloba aqvs. agronomiuli TvalsazrisiT iseTi koStebis mqone niadagebs, romlebic wylis moqmedebiT ar iSlebian, mtkice s t r uqt ur i ani niadagebi ewodeba. Uustruqturo ni ad agebi i s eT i ni ad agebi a, r o mel T a ko S t ebi wyal S i ad vi l ad i S l ebi an.

struqturis simtkicisa da wylis mimarT misi gamZleobisaTvis didi mniSvneloba aqvs koloiduri nawilakebis sididesa da mdgomareobas. Kkoloidebi akowiweben (acementeben) da amagreben niadagis nawilakebs. Yyvelaze mtkice struqtura axasiaTebs bunebriv yamir da xelovnurad, mravalwliani parkosani da marcvlovani balaxebis naTesiT gayamirebul niadagebs, romelTa koStebi mdidaria mkvdari organuli ni vT i er ebi T d a S eko wi webul i a mc enar eT a f esvebi T .

Nniadagis struqturaze damokidebulia sakvebi nivTierebiTa da haeriT uz r unvel yo f a mcenareTa zrdisa da ganviTarebis periodSi maqsimalurad. struqturuli niadagi yovelTvis ukeT awvdis mcenares sakveb nivTierebas, vidre gamtverebuli, naleqebsac ufro metad ST anTqavs da inarCunebs, arakapilarul forebs sakmaod raodenobas Seicavs da amis gamo haeraciac ukeTesi aqvs. struqturul niadagSi wyali da haeri erTdroulad saTanado SefardebiT aris warmodgenili da saukeTeso pirobebia Seqmnili mikroorganizmebisaTvis, romelTa cxovel myo f el o bi s Sedegad niadagSi grovdeba mcenarisaTvis SesaTvisebeli sakvebi nivTiereba. Aamgvar ad , ni ad agi s s t r uqt ur az e bevr ad ar i s d amo ki d ebul i ni ad agi s nayo f i er eba. arCeven makrostruqturas (niadagis nawilakebis diametris sidide > 0,25 mm ) da

mi kr o s t r uqt ur as (ni ad agi s nawi l akebi s d i amet r i s s i d i d ea < 0,25 mm).

struqturuli niadgis koStebi unda iyos 0,25-10 mm diametris sididis. maTgan 3-10 mm

diametris koStebs uwodeben msxvils, 1-3 mm - saSualos, 0,5-1 mm-wvrils, 0,25-0,5 mmmar c vl o vans , < 0,25 mm-z e mets mi akuT vneben mt vr i s ebr s .

## niadaguri haeri

niadagi, rogorc foriani sxeuli yovelTvis Seicavs haers, amis gamo uhaero niadagi

ar arsebobs. niadagSi haeri gvxvdeba samgvar mdgomareobaSi: 1. Tavisufal; 2. adsorbaciul da 3. xsnad mdgomareobaSi. Raodenobrivad pirveli amaTTagani sWarbobs danarCen ors. Tavisufal haers ukavia wylisagan Tavisufali forebi. Adsorbciuli haeri niadagis wvril dispersiuli nawilis zedapirzea St anT qmul mdgomareobaSi. X s nad i haer i ni ad agi s t enS i a gaxs ni l i .

Niadaguri haeri atmosferuli haerisagan gansxvavdeba. Niadagis haeri naxSirorJangs bevrad meti raodenobiT Seicavs, vidre atmosferuli, Jangbadi ki niadagis haerSi mcirea. Mcenaris zrda ganviTarebisaTvis, baqteriebis cxovelmyofelobisaTvis da ni ad agS i mi md i nar e qi mi ur i d a bi o l o gi ur i **ni ad agi s haer i s Sed geni l oba (n.s . s o ko l ovi s mi xedvi T ) c xr . # 2**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| nakveT i s xas i aT i | niadagis  haeris saSualo Sedgeniloba %obiT | | S ed geni l o bi s uki d ur es i f ar gl ebi | | avtorebi da  dakvirvebis agdili |
| O | CO2 | O | CO2 |
| nakel i T gano yi er ebul i aneuli | - | - | 18,6-19,0 | 0,3-2,7 | mosolovi t.  s.s. sacdeli mindori |
| unakelo aneuli | - | - | 16,8-19,2 | 9,5-2,6 |
| mdelo | - | - | 11,5-16,2 | 1,6-2,1 |
| qviSnari Tixnari  ganoyi  erebuli  xnuli    d aWao bebul i | 20,6 20,6 20,0 | 0,16  0,25 0,65 | 20,4-20,8  20,0-20,9  19,2-20,5 | 0.05-0.30  0,07-0,55  0,28-1,40 | liau  (germania) |
| kartofili (nakel i T gano yi er ebul i ) qviSnarze | 20,3 | 0,61 | 19,8-21,0 | 0,09-0,94 | inglisi |
| gaunoyierebeli xnuli | 20,4 | 0,2 | 18,0-22,3 | 0,1-1,4 |
| nakel i T gauno yi er ebel i xnuli | 20,3 | 0,4 | 15,7-21,2 | 0,3-3,2 |
| saZovari | 18,4 | 0,6 | 16,7-20,5 | 0,3-3,3 |

procesebisaTvis, niadagis haers didi mniSvneloba aqvs. niadagis haeri da wyali mis forebSia moTavsebuli, erTis gazrda meoris Semcirebas iwvevs. niadagis Tvisebebis mixedviT forebSi cvalebadia, rogorc haeris ise wylis raodenoba. niadagis unars gaat ar o s T avi s mas aS i haer i , haer gamt ar o ba ewo d eba.

niadagis haeris da atmosferos haeris Sedgeniloba gansxvavdeba erTmaneTisagan, atmosferos haeri Seicavs 79,07% azots, 20,96 % Jangbads da 0,03% naxS i o r o r Jangs , ni ad agi s haer i ki S ei c avs 79 % az o t s , 20,3 % Jangbad s , 0,15-0,6% naxS i r o r J angs .

## ni ad agi s T bur i T vi s ebebi

mcenaris zrda-ganviTarebis, agreTve niadagwarmoqmnis procesisaTvis siTbo mniSvnelovani faqtoria. niadagis siTbos MmTavar wyaros warmoadgens mzis energia. ni ad agi s s i T bo s wyar o T a S o r i s meo r exar i s xo vani r o l i bi o qi mi ur i pr o c es ebi s S ed egad gamoyofil siTbos ekuTvnis siTbur reJims didi mniSvneloba aqvs, niadagSi qimiuri da biologiuri procesebis mimdinareobisaTvis. niadagis unars gaataros siTbo Tavis masaS i , T bgamt ar o ba ewo d eba. ni ad agi s s xvad as xva t i pebi d an xi r xat i ani ni ad agebi s i T bo s kar gi gamt ar ebi ar i an. niadagis mier mzis sxivuri energiis STanTqmis unars **s xi vur i ST anT qma** ewodeba. sxi vur i ener gi a S T anT qmi s Semd eg s i T bur ener gi aS i gad ad i s.

**Tbotevadoba** warmoadgens siTbos im raodenobas (kl.) romelic saWiroa 1 g. niadagis 10-z e gas aT bo bad .

**siTbos gamtaroba** ewodeba niadagis unars gaataros siTbo Tavis masaSi, meti

t emper at ur i s f eni d an nakl ebi t emper at ur i s f eni s aken.

**s xi vT f r qveva** – sxivTSTanTqmis sawinaaRmdego movlenaa. sxivTfrqvevis Sedegad STanTqmuli siTburi energiis raodenoba mcirdeba niadagSi, temperatura ecema. sxivTfrqvevis yvelaze maRali maCvenebliT xasiaTdeba wyali, xolo yvelaze dabaliT – haeri.

siTbos im raodenobas, romelic saWiroa nadagis masis an moculobis erTeulis gasaTbobad, niadagis Tbotevadobas uwodeben. niadagis Tbotevadobaze gavlenas axdens ni ad agi s meqani kur i d a qi mi ur i Sed geni l o ba, f er i , r el i ef i s f o r ma, t eni ano ba d a sxva.

niadagis siTbur reJimze didada damokidebuli kulturul mcenareTa zrda ganviTareba. temperaturis sididezea damokidebuli qanebis gamofitva, organuli ni vT i er ebi s d aS l a d a s xva bi o qi mi ur i pr o c es ebi .

niadagSi siTbos reJimis gaumjobesebisaTvis didi mniSvneloba aqvs niadagis fizikuri Tvisebebis gaumjobesebas. amisaTvis saWiroa niadagSi Setanil iqnas organuli sasuqi, xelsayrelia niadagis morwyva Tbili wyliT. niadagis gafxviereba aumj o besebs , rogorc niadagis haeracias, ise siTbur reJimsac. saTburebSi SesaZlebelia gamoyenebul iqnas biosaTbobi, mcoxnavi pirutyvis CalaSereuli nakeli, agr eT ve gaz i d a el eqt r o ener gi a, bunebr i vi c xel i wyl ebi .

saSemodgomo kulturaTa naTesebSi siTbos reJimis gasaumjobeseblad iyeneben Tovlmelioracias. amasTan mniSvnelovania mindorsacavi tyis zolebis mowyoba. ni ad agS i s i T bo s S es anar Cunebl ad s aukeT es o saS ual ebas war mo ad gens mul Ci s gamo yeneba. yvelaze mTavari niadagis haerisa da siTbos reJimis regulirebisaTvis saukeTeso s aS ualebaa niadagis swori damuSaveba, rac mniSvnelovan gavlenas axdens ni ad agi s struqturisa da simkvrivis gaumjobesebaz e. mebostneobaSi dilis wayinvebis Tavidan asacileblad iyeneben e.w. kvamlis fardebs. am SemTxvevaSi gvian Rame an alionze anTeben did kocons, warmoqmnili kvamli “wveba” naTesebze Tu nargavebze da icavs maT Zl i er i gac i ebi s agan.

## ni ad agi s fiziko-qi mi ur i T vi s ebebi

**STanTqmiTi unarianoba.** myari Txieri da gazisebri fazebi niadagSiganuwyvet l i v ur T i er T qmed eben**.** niadagis mier, Txier an gazisebr mdgomareobaSi myofi sxvadasxva SenaerTis STanTqmas- STanTqmis unarianobas uwodeben igi miwaTmoqmedebaSi did rols asrulebs. STanTqmiTi unarianoba ganapirobebs sxvadasxva xsnadi SenaerTebis Sekavebas, maT Soris fesvur i kvebi s mni S vnel o van el ement ebs . ar Ceven S T anT qmi T i unar i ano bi s xuT s axes : bi o l o gi ur s , meqani kur s , qi mi ur s , f i z i ko -qi mi ur s (gac vl i T s ) d a f i z i kur s.

**biologiuri STanTqma.** mcenareTa da mikroorganizmebis mier niadaguri kvebis elementebis SerCeviT SeTvisebas biologiur STanTqmas uwodeben. aseTi STanTqmis saSualebiT mcenareTa sakvebi elementebi niadagis Rrma fenidan saxnav fenaSi gad aad gi l d eba, sad ac kul t ur ul mc enar eT a f es vT a s i s t emi s aT vi s xel mi s awvd o mi xd eba.

**meqanikuri STanTqma.** niadagis unars filtraciis dros Seakavos nawilakebi, romlebic diametriT aWarbeben niadagis forebs, meqanikur STanTqmas uwodeben. uxv naleqian da sarwyav raionebSi meqanikuri STanTqmis roli didia. mZime, humusiani niadagebi ukeT es i S t anT qmi s unar i ano bi T xas i aT d ebi an.

**qimiuri STanTqma.** qimiur STanTqmas uwodeben STanTqmis iseT saxes, rodesac xsnarSi

myo f i xs nad i mar i l ebi s ani o nebi kaT i o nebT an S eer T ebi T i Zl eva Znel ad xs nad an uxs nad SenaerTebs, romlebic xsnaridan gamoileqeba. am gziT xdeba niadagSi karbonatebisa da f o s f at ebi s d agr o veba.

**fizikur-qimiuri anu polaruli STanTqma** imaSi mdgomareobs, rom xdeba xsnarSi

myofi molekulebis erTi nawilis mizidva, miziduli nivTiereba niadagis koloidur kompleqsidan aZevebs imave muxtis mqone sxva elementebis ionebs da TviTon ikavebs mis adgils.

**fizikuri anu molekuluri STanTqma** xdeba niadagis koloiduri-d i sper s i ul i

nawilis Tavisufali zedapiruli energiis saSualebiT. zedapirulad aqtiuri nivTierebebi miizideba dispersiuli fazis mier, am movlenas dadebiTi adsorbcia ewodeba, xolo im nivTierebebs, romlebic zedapirul daWimulobas adideben da Tavs iyrian dispersiuli nawilakebis periferiul SreSi, uaryofiT adsorbcias uwodeben. am ukanaskneli nivTierebebis did nawils niadagi ver akavebs da emorCileba xsnarebis moZraobas.

niadagis fizikuri STanTqmis dros adgili aqvs xsnaridan mTeli molekulebis STanTqmas, xolo STanTqmuli nivTierebebi niadagis myari fazis SedgenilobaSi ki ar S ed i s , ar amed r Ceba xs nar S i S ekavebul md go mar eo baS i .

fizikuri STanTqmis unarianoba damokidebulia niadagis meqanikur Sedgenilobaze, niadagSi koloidebisa da humusis raodenobaze. Tixian da humusiT mdidari niadagebSi es procesi kargad aris gamoxatuli, xolo msubuqi meqanikuri Sedgenilo bi s ni ad agebS i ki sustad.

## niadagis reaqcia PH

niadagis reaqcia udides gavlenas axdens mcenaris zrda-ganviTarebasa da mikroorganizmebis cxovelmyoflobaze. arian mcenareebi, romlebic tute reaqcias ver itanen – iRupebian da, piriqiT, tute reaqciis pirobebTan Seguebul mcenareebs uWirs mJ ave r eaqc i i s ni ad agS i ganvi T ar eba.

niadagis reaqcia dakavSirebulia niadagwarmoqmnis procesTan. ewerwarmoqmnis process mJave reaqcia axasiaTebs, Savmiwaniadagianisas – neitraluri, xolo mSrali stepis niadagebs – tute reaqcia (niadagis reaqciaze gavlenas axdens qanis qimizmi, fuZian an karbonatul qanebze warmoqmnil niadags ganviTarebis garkveul safexurze nei t r al ur i an s us t i t ut e r eaqc i a axas i aT ebs ).

agronomiul mecnierebas niadagebis reaqciis regulirebis mZlavri saSualebani gaaCni a, mJave reaqciis niadagebis mokirianebisa da tute reaqciis niadagebis SemJavebis R o ni s Zi ebaT a s axi T .

niadagis tute reaqcia hidrolizurad tute marilebis arsebobiT da STanTqmuli Na–iT aris gamowveuli. mJave reaqciis gamomwvev mizezs ki niadagSi Tavisufali mJavebi sa (o r ganul i ) d a mJ ave mar i l ebi s ar s ebo ba war mo ad gens .

niadagis r eaqc i i s 2 f o r mas ar Ceven: 1. aqt ual ur s (aqt i ur s ) d a 2. po t enc i ur s.

aqtiuri mJavianobis gamomwvevi wyalbadionebi niadagis Txevad nawilSi arian

moTavsebuli, potenciuri mJavianobis gamomwvevi H–ionebi ki niadagis myar nawilSi – STanmTqav kompleqsSi. am ukanaskneli ionebis aqtivobis mixedviT potenciur mJavianobas 2 saxed yo f en: 1. gac vl i T (S ed ar ebi T aqt i ur i H–i o nebi T gamo wveul i ) d a 2. hi d r o l i z ur mJ avi ano bad (pas i ur i H–i o nebi T gamo wveul i ).

wyliT gamonawuris aqtualur reaqcias gansazRvravs ionizebuli wyalbadi da

hidroqsilionebi. xsnad mdgomareobaSi myofi, rogorc ionizebuli ise arai o ni z ebul i mJ avebi d a t ut eebi ki gans az R vr aven t i t r ac i ul r eaqc i as .

## organuli nawili

niadagis organuli nawili warmoiqmneba mcenareuli da cxoveluri organizmebis daSlisa da niadagTan maTi SeerTebis Sedegad. raSic gansakuTrebuli mniSvneloba aqvs mi kr o o r gani z mebi s c xo vel mo qmed ebas . organuli nawili niadagSi ori saxiT gvxvdeba mkvdari da cocxali. mikroorganizmebis moqmedeba mimdinareobs aerobul (Jangbadian) an anaerobul (uJ angbad o ) pi r o bebS i .

Aaerobul pirobebSi mimdinare mikrobiologiuri procesis Sedegad niadagis organuli nawili ganicdis srul mineralizacias, romlis Sedegad miiReba daJanguli myari martivi naerTebi. anaerobuli mikrobiologiuri procersis Sedegad ki miiReba dauJangavi naerTebi. garda am procesebisa niadagSi mimdinareobs uaRresad didi mniSvnelobis procesi humifikacia**,** ris Sedegad niadagSi arsebul organuli nivTierebebis nawili mikroorganizmebis moqmedebiT gardaiqmneba humusad.humusis ni ad agT an S eer T ebas ki humi ki kac i as uwo d eben.

organul nivTierebebs mcenare ver iyenebs igi unda daiSalos martiv mineralur

nivTierebad. im process, rodesac organuli nivTiereba bolomde daiSleba, organuli ni vT i er ebi s mi ner al i z ac i a ewo d eba.

organuli nivTierebis daSlis procesSi niadagSi warmoiqmnebian mdgradi bunebis SenaerTebic, romelTa daSla neli tempiT mimdinareobs. am Tvisebis gamo aseTi SenaerTebi grovdeba da didxans inaxeba niadagSi, isini xasiaTdebian gansakuTrebuli TvisebebiT, aqvT Taviseburi agebuleba da Seferilni arian muq an Sav feradac ki, maT uwodeben neSompala da humusovan nivTierebebs. niadagis humususis didi nawili am ni vT i er ebebi s agan S ed geba. humusi warmoadgens niadagis metad rTul nawils, organul-mineralur kompleqss. humusi niadagSi udidesi mniSvnelobisaa mcenareTa kvebis saqmeSi. humusiT mdidari struqturiani niadagi maRali mosavlis miRebis realuri garantiaa. humusi did rols asrulebs niadagis STanTqmis unarianobis saqmeSi. gansakuTrebul dadebiT gavlenas axdens niadagis fizikur Tvisebebze. humifikacia niadagis struqturis Seqmnis erTer T i mni S vnel o vani f aqt o r i a.

humusis SedgenilobaSi arCeven sam Zi r i T ad ni vTierebas: 1. humusis mJaveebs, 2. fulvo

mJ aveebs d a 3. humi ns d a ul mi ns mJavas.

huminis mJaveebi warmoadgenen niadagis humusis mniSvnelovan nawils. igi yovelTvis Seicavs azots. huminis mJaveebi Tavisufal mdgomareobaSi Savi bzinvare fxvnilia, wyalSi iZlevian mura feris sust koloidur xsnars. tuteebTan warmoqmnis marilebs, romlebic advilad ixsneba wyalSi. kalciumis, magniumis, bariumis, rkinisa da aluminis kationebTan iZleva wyalSi uxsnad marilebs. huminis mJaveebidan gamoyofen mura huminis mJavas, romelic niadagSi yovelTvis Tavisufali saxiT moipoveba, am mJavas meorenairad ulminis mJavasac uwodeben da Savi huminis mJava, romelic SeerTebuli aris ko l o i d ebT an d a magni umT an. fulvomJaveebi warmoadgenen organul mJaveebs, romlebic Seicaven azots. fulvomJaveebs marilebTan SeuZliaT Seqmnan kompleqsuri naerTebi rkinisa da aluminis JangeulebTan. fulvomJaveebidan gamoyofen krenisa da apokrenis mJaveebs. fulvomJaveebis kalciumisa da magniumis marilebi wyalSi xsnadia, aluminTan da r ki nas T an qmni an mar i l ebs , r o ml ebi c nei t r al ur i r eaqc i i s d r o s ar i xs nebi an.

humini da ulmini warmoadgenen humusis inertul nawils. humini da ulmini mtkiced aris SekavSirebuli niadagis mineralur nawilTan, riTac unda aixsnas am naerTebis i ner t ul o ba.

humusis agronomiuli mniSvneloba metad didia. marTalia mcenare uSualod humusiT

ar ikvebeba, magr am sakveb ni vT i er ebaT a Zi r i T ad i wyar o a.

humus d i d i mni S vnel o ba aqvs ni ad agi s S T anT qmi s unar i ano bi s , s t r uqt ur i s , f i z i kur -

qimiuri da biologiuri Tvisebebis gaumjobesebaSi. amitom miwaTmoqmedebis amocanaa xeli Seuwyos niadagSi humusis dagrovebas da gaataros RonisZiebebi niadagSi ar s ebul i humus i s mar agi s S esanar Cuneba.

**ni ad agi s qi mi ur i Sed geni l o ba d a kvebi s r eJ i mi**

ni adagis nayofiereba gulisxmobs, rom daakmayofildes mcenaris moTxovnileba

wyl i T a d a s akvebi ni vT i erebebiT. niadagSi sakvebi nivTierebebi imyofeba wyalSi xsnad da uxsnad mdgomareobaSi. kvebis elementebis umetesoba niadagSi moipoveba wyalSi Znelad xsnad organul da mi ner al ur i S enaer T ebi s s axi T .

mikroorganizmebis meSveobiT xdeba sakvebi nivTierebebis mc enar i saT vi s SesaTvisebel mdgomareobaSi gadayvana. biologiuri da qimiuri procesebis ur T i er T moqmedebis Sedegad niadagis wyalSi uxsnadi SenaerTebi gadadian xs nad SesaTvisebel mdgomareobaSi. am process SeiZleba xeli SevuwyoT niadagis wesieri damuSavebiT, Teslbrunvebis SemoRebiT, organul-mineraluri sasuqebis SetaniT, mJave niadagebis mokirianebiT, damlaSebuli niadagebis moTabaSirebiT da wylis reJimis gaumj o bes ebi T .

mcenaris kvebis umTavresi elementebi: azoti, fosfori, kaliumi, kalciumi, magniumi,

go gi r d i , bo r i , r ki na d a s xva ni ad agS i i s i ni s xva d a s xvagvar md go mar eo baS i gvxvd eba. **az o t i .** azoti Sedis yvela martivi da rTuli cilebis, nukleinmJavebis,

qlorofilis, vitaminebis, fermentebis, alkaloidebis da sxva organuli SenaerTebis SemadgenlobaSi. am elementis simciris dros ferxdeba da knindeba mcenaris miwiszeda organoebisa da fesvTa sistemis zrda-ganviTareba. is inviTarebs mokle wvril muxlTSorisebs, mcire zomis Ria mwvane Seferilobis foTlebs. azotis deficitis dros, qlorofilis daSlis gamo mcenaris qveda foTlebi avaddeba qloroziT da mTlianad yviTldeba. zogierTi mcenaris foTlebi iReben mowiTalo Seferilobas. TiTqmis Cerdeba zrda-ganviTareba da reproduqciuli organoebis warmoqmnis procesi.

Cqar d eba mo mwi f eba.

azotiT Warbi kveba xels uwyobs MmZlavri savegetacio masis warmoqmnas, mkveTrad mcirdeba reproduqciuli organoebis Casaxva, ganviTareba da nayofmsxmoiaroba. mcenaris foTlebi iReben muq mwvane Seferilobas, nayo f ebi ki Ria mwvanes an mwvanes. mcenareul produqtebSi grovdeba didi raodenobiT azotis cilovani da ara cilovani SenaerTebi- gansakuTrebiT adamianis jamrTelobisaTvis saSiSi nitratebi xi l bo s t neul i s nayo f ebi ad vi l ad l peba.

**fosfori.** fosfori monawileobs fotosinTezis, sunTqvis duRilis, gamravlebis,

nivTierebaTa cvlis, naxSirwylebisa da cilebis warmoqmnis daSlis da sxva procesebSi. is Sedis protoplazmis birTvis, Hhormonebis, vitaminebis, fermentebis, nukleinmJavebis, fosfatidebis fitinis, saxarofosfatebis, da sxva organuli SenaerTebis SemadgenlobaSi. am elementis simcire aferxebs da akninebs mcenaris miwiszeda organoebisa da fesvTa sistemis zrda-ganviTarebas. mcenaris qveda foTlebi iReben muq mwvane Seferilobas, deficitis SemTxvevaSi momwvano-mocisfero an alisfers. saerTod Cerdeba reproduqciuli organoebis warmoqmnis, yvavilobis da momwifebis procesi. ganviTarebuli nayofebi, taroebi da TavTavebi Zalze mcire zomisaa da Seuvsebeli. fosforis deficitis gaxangrZlivebisas foTlis ZarRvTSorisi qs o vi l ebi i wyeben xmo bas.

fosforiT Warbi kvebisas Cqardeba mcenaris ganviTarebis fazebis gavla, foTlebi

naad r evad Wkneba d a xmeba, ad r e mT avr d eba veget ac i a.

**kal i umi .** kaliumi did rols asrulebs mcenareSi adenozintrifosfatis warmoqmnaSi, romelic energiiT amaregebs fotosinTezis, Saqrebisa da cilebis sinTezis procesebs. is aaqtiurebs fermentebs, aregulirebs bageebis gaxsnas da daxurvas, adidebs azo t i ani s as uqebi s ef eqt ur o bas . am el ement i s s i mc i r i s d r o s muxr uWd eba Uuj r ed i s d ayo f a, z r d a da gaWimva, ferxdeba mcenaris zrda ganviTareba, mcirdeba mosavlianoba da sokovani davadebaTa mimarT gamZleoba. foTlebi iReben muq mwvane Seferilobas, z o gi er T i mcenaris foTlebi muq Sindisfers. misi firfita naoWdeba. kaliumiT xangrZlivi SimSilis dros qveda iarusis foTlis kideebi iReben yviTel Sefervas, SemdgomSi es adgilebi xmeba da zemoTa mxares exveva, rac foTlis ,,kideebis sidamwvris” saxeliTaa cnobili. kaliumis siWarbis simptomebi simciris analogiuria da apirobebs ,,kideebis s i d amwvr es”.

**kalciumi.** kalciumi marTalia ar Sedis qlorofilis SemadgenlobaSi, magram did rols asrulebs fotosinTezis, nivTierebaTa cvlis, naxSirwylebis gadanacvlebis, azotovani SenaerTebis gardaqmnaSi da sokovani davadebebis mimarT gamZleobis gadidebaSi. misi simciris dros ziandeba fesvebisa da miwiszeda organoebis zrdis wertilebi da kvirtebi. Cerdeba fesvebis zrda, irRveva ujredis kedeli da wyliandeba, radgan peqtinovani nivTierebebi da lipoidebi ixsnebian da gardaiqmnebian cremlismagvar ustruqturo masad, rac arRvevs fesvebis mier sakvebi elementebis S eT vi s ebas .

kal c i umi T S i mS i l i s d r o s f o T l i s f i r f i t i s Zar RvT S o r i s ebS i war mo i qmneba, naT el i Ria TeTri Seferilomis laqebi, romlebic SemdgomSi mTel firfitas ikaveben. amasTan erTad adgili aqvs foTlis firfitis kideebis xmobas, qsovilebis ujredis kedlis gaT xel ebas d a gal o r wo vnebas , r i s gamo c f o T l ebi S ei Zl eba Eer T maneT z e d aewebo s .

kal c i umi s s i War be api r o bebs mc enar i s naad r evad d aber ebas .

**magniumi.** magniumi Sedis qlorifilis SedgenilobaSi. aaqtiurebs fermentebisa da askorbinmJavas warmoqmnis process, monawileobs Jangva- aRdgeniT procesebSi. xels uwyobs fosforis SeTvisebas, dadebiT gavlenas axdens nayofwarmoqmnisa da maT momwifebaze. am elementis simcire iwvevs qlorozs, romlis drosac mcenaris qveda foTlebis ZarRvTSorisebi iReben aWrelebul- Ria mwvane, Ria YyviTel, narinjisfer an wiTel Sefervas da foTlis firfita zemoT mxares exveva. xangrZlivi SimSilis dros ql o r o z i T d avad ebul i ubnebi xmeba, i mt vr eva d a f o T l ebi c viva.

magni umi T War bi kvebi s as f er xd eba mc enar eS i kal c i umi s a d a kal i umi s Ses vl a.

**go gi r d i .** gogirdi Sedis yvela cilebis, zogierTi aminomJavis, mcenareuli zeTebis, vitaminebis SedgenilobaSi. monawileobs Jangva aRdgeniT procesebSi. azotovan naxSirwylovan cvlaSi, sunTqvisa da cximebis cvlis procesSi. mcenareze gogirdis simciris simptomebi Zalian waagavs azotis SimSilis niSnebs. Tavdapirvalad qveda foTlebi iReben Ria mwvane Seferilobas, amasTan erTad adgili aqvs ylortebis gaxevebas d a maT i d i amet r i s gad i d ebas .

**bo r i .** bori did gavlenas axdens naxSirwylovan, cilovan da nukleinovan cvlaze. misi simciris dros irRveva sinTezuri da naxSirwylebis gadanacvlebis, r epr o d uqc i uli organoebis warmoqmnisa da ganayofierebis procesebi, mcirdeba nayof msxmoiaroba. am elementiT SimSili azianebs axalgazrda mozard organoebs, romelTa zrdis wertilebi, zeda kvirtebi da bususa fesvebi xmebian da inviTareben Zlier gverdiT gantotvas. amasTan erTad adgili aqvs foTlebis rozetis, muqi Seferilobis deformirebuli nayofebis warmoqmnas, romlebzec SeiniSneba mkvdari qsovilebis laqebi. xorbali da simindi inviTarebs patara zomis, maxinj da umarcvlo TavTavsa da taros, radgan boris deficitis dros mtvris marcvali kargavs ganayofierebis unars, r i s gamo c mar c val i ver i s axeba..

bo r i s s i War be api r o bebs maxi nj i T avT avebi s , t ar o ebi sa d a nayo f ebi s war mo qmnas .

**rkina.** rkina monawileobs qlorofilis sinTezSi, sunTqvisa da nivTierebaTa cvlis procesebSi. Sedis Jangva aRdgeniTi fermentebis SemadgenlobaSi. am elementis simciris dros adgili aqvs qlorofilis warmoqmnis darRvevas, ris gamoc foTlebi kargaven mwvane Seferilobas da viTardeba qlorozi. rkiniT xangrZlivi SimSilis dros aR i ni S neba f o T l i s ki d eebi s a d a wver i s xmo ba. d avad ebul i f o T l ebi naad r evad c vi va

## s aqar T vel os ni adagebi s umT avr es i t i pebi

rogorc cnobilia saqarTvelo mciremiwiani qveyanaa, magram sxva qveynebisagan

gansxvavebiT xasiaTdeba niadaguri siWreliT. am mxriv igi SeiZleba niadagur muz eums SevadaroT. es mravalferovneba niadagwarmomqmnel faqtorTa da niadagebis eqspl uat ac i i s xas i aT i T aa gamo wveul i .

**niadagis tipi.** niadagTa klasifikaciaSi niadagis tipi msxvili taqsonomiuri erTeulia. am cnebaSi gaerTianebulia konkretuli niadagebis rigi, romelTac axas i aT ebs war mo qmni s d a ni vT i er ebaT a gar d aqmni s a d a gad aad gi l ebi s er T o bl i o ba.

**qvetipi** S ed i s tipis SedgenilobaSi da aerTianebs niadagebis jgufs, romelTac aqvT sxvadasxva niadagebisaTvis damaxasiaTebeli niSnebi. magaliTad, eweri tipis niadagebSi, gamo i yo f a ko r d i an-ewer ebi s , ewer -l ebi ani ni ad agebi s qvet i pebi .

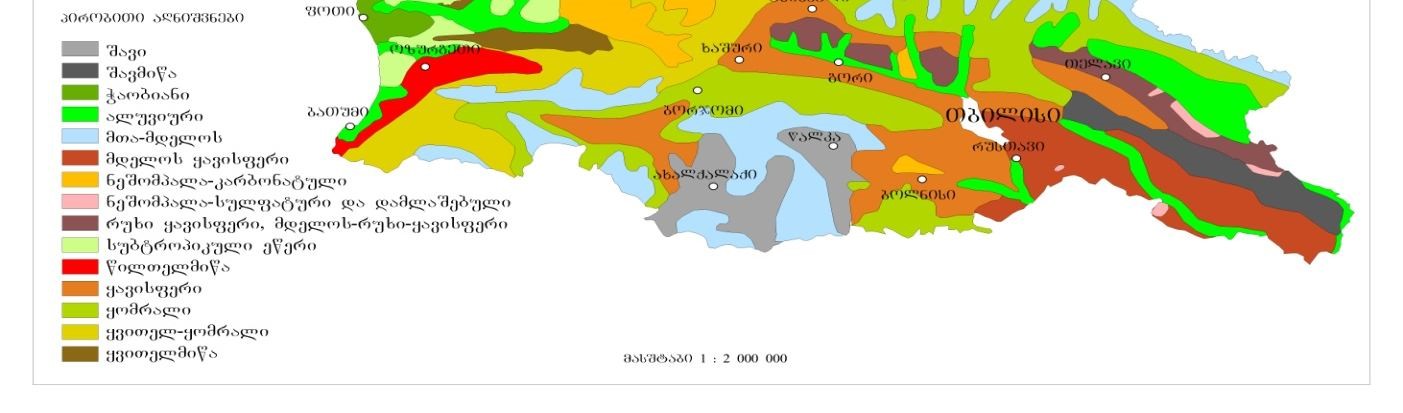
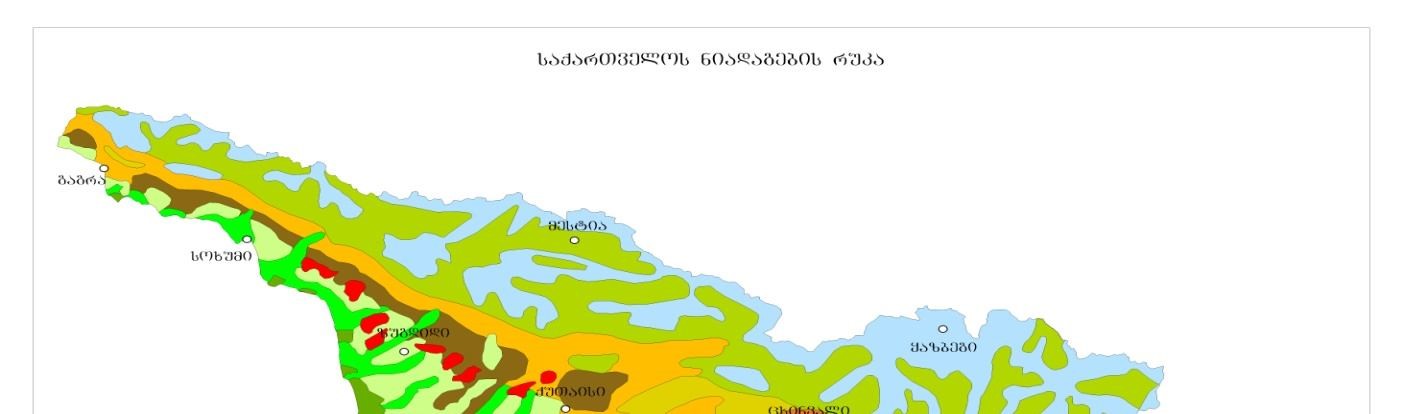
niadagis saxeoba warmodgenas gvaZlevs niadagwarmoqmnis procesis ganviTarebis xarisxze. mag. Zlier gaewrebuli, saSualo gaewrebuli, sustad gaewrebuli niadagebi d a a.S .

T. uruSaZis monacemebiT saqarTveloSi gavrcelebulia niadagis Semdegi ZiriTadi tipebi: mTa mdelos kordiani, mTamdelos kordian-kar bonatuli, mTa mdelos kordiani S avmi webi , mTa mdelos torfiani da lebiani, mTis Savmiwisebrni, mTis Savmiwa, mTa tye mdelos, yomrali tipiuri, renZino yomrali, yviTeli yomrali, neSompala karbonatuli, yviTelmiwa, yviTelmiwa eweri, yviTelmiwa ewer lebiani, wiTelmiwa tipiuri, wiTelmiwa gaewrebuli, wiTelmiwa ewer lebiani, mineralur Waobiani dalamian Waobiani, mdelos Waobiani, yavisferi da renZino yavisferi, ruxi yavisferi, gajiani mdelos ruxi yavi sf er i , bar i s S avmi webi , bi c o bi , bi c i s ko mpl eqs i , al uvi ur i ni ad agebi .

saqarTvelos geografiuli mdebareoba, reliefi da sxva faqtorebi, miuxedavad teritoriis simcirisa (69,7 km2), mtkiced gansazRvraven misi bunebrivi da sameurneo pi r o bebi s mr aval f er o vnebas ni ad agi s gvar i war mo d genas gvaZl evs ni ad agi s i m T vi s ebaz e, rac gamowveulia dedaqanis TaviseburebebiT. mag. niadagebi karbonatul qanebze, an kvar c i an qvi S ebz e d a s xva.

qveynis aRmosavleTi da dasavleTi nawilebis geomorfologiuri Taviseburebebi, klimati, mcenareuloba da sxva faqtorebi aucileblad apirobeben geografiuli raionebis c al keul o l qebad d a z o nebad gamo yo f as .

mTlianad saqarTvelo geomorfologiuri niadagur-klimaturi da sxva bunebrivi pirobebiT erTmaneTisagan Zlier gansxvavebulia: dasavleTi, aRmosavleTi da samxreT s aqar T vel o i yo f a ni ad agebi s c al -c al ke o l qebad .



## d as avl eT saqar T vel o

akad. m.sabaSvils dasavleT saqarTveloSi gamoyofili aqvs niadagebis zonebi da qvezonebi: dasavleT saqarTvelos niadagebis olqi: 1. dablobis Waobiani da eweri niadagebis zona; 2. gorakiani mTiswinebis wiTelmiwa da yviTelmiwa niadagebis zona;

3. mT a-t yeT a ni ad agebi s z o na; 4. mT a-md el o T a ni ad agebi s z o na.

1. **dablobis Waobiani da eweri niadagebis zona**. am zonaSi niadagebis daWaobeba gamowveulia Warbi atmosferuli naleqebiT, vake reliefiT, alag gruntis wylebiT, niadagebis mZime meqanikuri SedgenilobiT da ustruqturobiT. Waobis niadagebidan aq gavr c el ebul i a Wao bi ani , t o r f i ani , Wao bi s -l ami ani d a md el o s Wao bi ani niadagebi.

dasavleT saqarTvelos subtropikuli zonis Waobiani niadagebis saxalxo-

sameurneo mniSvneloba metad didia. subtropikuli klimati da miwebis melioracia, romelic didi maSs tabiT iqna ganxorcielebuli kolxeTis dablobze, farTo SesaZleblobas qmnis subtropikuli meurneobis ganviTarebisaTvis. amasTan erTad farTodaa ganvTarebuli erTwliani kulturebi da mecxoveleoba. torfiani niadagebi daSrobas ar eqvemdebarebian da gamoyenebulia organuli da o r ganul -mi ner al ur i s uqebi s d as amz ad ebl ad .

1. **go r aki ani mT i s wi nebi s wi T el mi wa d a yvi T el mi wa ni adagebi s z o na**

wiTelmiwa niadagebi gavrcelebulia borcvian-gorakiani reliefis pirobebSi zRvis

donidan 50-300 metris simaRleze. am niadagebis formireba ZiriTadad and ez i t o baz al t ebz e T i xebz e xd eba.

wiTelmiwebi, meqanikuri Sedgenilobis mixedviT, umetesad mZime Tixnar da Tixebs

war mo ad genen axasiaTebs struqturuli agregatebis simtkice da mJave reaqcia ( (PH-5,25,5) zogjer 3-5 aRwevs(l.sariSvili) da misi zeda horizonti sakmaod mdidaria humusiT (6-8). niadagis humusi fulvomJaveebs meti raodenobiT Seicavs, vidre huminis mJavas, huminis mJaveebis, simcire uaryofiT gavlenas axdens am niadagebis mTel rig Tvisebebze (STanTqmis tevadoba, azotis Semcveloba da sxva) saerTo azotis Semcveloba humusis Semcvelobis Sesabamisad cvalebadobs 0,18-0,30%-i s farglebSi, zeda fenebSi (0-50 sm) mTliani fosforis Semcveloba 0,08-0,19% farglebSi meryeobs, wiTelmiwebSi kaliumis r ao d eno ba, s xva ni ad agebT an S ed ar ebi T mc i r ea.

AdadebiTi agronomiuli Tvisebebis gamo wiTelmiwebs da yviTelmiwebs didi saxo f l o -sameurneo mniSvneloba aqvs. am niadagebze kargad xarobs subtropikuli kul t ur ebi , c i t r us ebi , t ungi , eT er z eT ebi , T ambaqo , d a s xva.

wiTelmiwa da yviTelmiwa niadagebis miwaTmoqmedebisaTvis gamoyenebisas d i d i

mniSvneloba aqvs eroziasawinaaRmdego RonisZiebebs, nayo fierebis gaumjobesebas. amisaTvis gamoyenebuli unda iqnas rogorc agroteqnikuri ise agr o mel i o r ac i ul i s aS ual ebani -ferdobebis daqanebis sawinaaRmdego mi mar T ul ebi T d amuSaveba, wyal d amWer i , wyal S emkr ebi kvl ebi s mo wyo ba, d at er as eba, s af ar i kul t ur ebi d a s xva.

**3. mTa-tyeTa niadagebis zona.** mTa tyeTa zonisaTvis damaxasiaTebelia tyis yomrali niadagebi. tyis yomrali niadagebi gamoirCevian sakmaod didi sisqiT, Tixnari d Tixa meqanikuri SedgenilobiT, kargad gamosaxuli humusiani horizontiT, humusis Semcveloba 8-10, zogjer 15-20%-mde aRwevs; organuli nawili uxeSi, nakleb humificirebuli saxiT aris warmodgenili, romelSic fulvomJaveebi TiTqmis orjer metia huminis mJaveebTan SedarebiT. yomrali niadagebi umetesad fuZeebiT aris maZRari. wyalbad ionebi umniSvnelo odenobiT aris dagrovili. amitom am niadagebs susti mJave reaqcia aqvs. magram yomrali niadagebis gaewrebuli saxeobebi saSualo mJavianobiT xas i aT d eba.

tyis yomrali niadagebis didi masivi tyeebis qveS imyofeba. magram mTa tyis zonis

qved a s ar t yel S i z R vi s d o ni d an 900 met r i s s i maR l ez e gamo yenebul i a mi waT mo qmed ebaS i .

t yis yomrali niadagebis miwaTmoqmedebisaTvis gamoyenebisas didi mniSvneloba aqvs eroziasawinaaRmdego RonisZiebebs, nayofierebis gaumjobesebas. amisaTvis gamoyenebuli unda iqnas rogorc agroteqnikuri ise satyeo melioraciuli saSualebani- f er d o bebi s daqanebis sawinaaRmdego mimarTulebiT damuSaveba, wyaldamWeri kvlebis mowyoba, d at er as ebi s s wo r i s i s t emi s SemuSaveba, s af ar i kul t ur ebi d a s xva.

**4. mTa-md el os niadagebis zona** am zonaSi yvelaze metad gavrcelebulia neS o mpal a – kar bo nat ul i ni ad agebi .

neS o mpal a-karbonatuli niadagebi Cveulebriv mdidaria humusiT, romlis raodenoba zogan 10%-s aRwevs, magram iq, sadac eroziis procesi gaZlierebiT mimdinareobs, niadagebi mcire sisqiT da humusis bevrad naklebi raodenobiT xasiaTdeba, romlis Semcveloba zeda horizontSi 3%-s ar aRemateba. saerTod neS o mpal a-karbonatuli niadagebis humusSi huminis mJaveebi sWarboben fulvomJaveebs. karbonatebis didi raodenobiT Semcveloba xels uwyobs niadagSi humusis dagrovebas da mtkice struqturuli agregatebis Serqmnas. vake reliefur elementebze, sadac sustia eroziis procesebi, gavrcelebulia degradirebuli neSompal a-kar bo nat ul i ni ad agebi , r o ml ebi c xas i aT d eba ni ad agi s pr o f i l i s met i s i s qi T , nakl ebi xi r xat i ano bi T , uf r o mZi me meqani kur i S ed geni l o bi T d a kar bo nat ebi s mc i r e Semc vel o bi T .

neS o mpal a-karbonatuli niadagebSi humusis Semcveloba zeda horizontSi sakmaod maRal i a- 3-8%. azotis raodenoba saerTod didia da meryeobs 0,23-0,52%-mde, xolo saerTo fosforis raodenoba 0,18-0,27%-i s farglebSi, karbonat ebi s raodenoba meryeo bs 12-56%-i s farglebSi. degradirebul neSompala karbonatul niadagebis zeda horizontebSi karbonatebi sruliad ar aris da neSompala-karbonatuli niadagebis nei t r al ur i , s us t i t ut e, xo l o d egr ad i r ebul s s us t i mJ ave r eaqc i a aqvs .

meqanikuri Sedgenilobis mixedviT neSompala-karbonatuli niadagebi umetesad mZime Tixnarebs da Tixebs warmoadgenen. aqvs kargi struqtura, ris gamoc miuxedavad mZime meqanikuri Sedgenilobisa, es niadagebi dadebiTi fizikuri da wylovani TvisebebiT gamo i r Cevi an.

neSompala-karbonatuli niadagebs farTod gamoiyeneba mravalwliani kulturebis gasaSeneblad. Tumca aseTi tipis niadagebze aucilebelia eroziasawinaaRmdego R o ni s Zi ebebi s gat ar eba, r o go r i c aa mel i o r ac i ul i d a agr o t eqni kur i R o ni s Zi ebebi .

S a v m i w e b i sakmaod aa gavr c el ebul i s aqar T vel o S i , r o go r c aR mo savl eT i s e d asavl eT s aqar T vel o S i .

saqarTveloSi Savmiwebi ZiriTadad gavrcelebulia vake reliefis pirobebSi umetesad liosisebr qanebze, gamonakliss warmoadgens j avaxeTis da walkis zeganis Savmiwebis didi nawili, romlebic formirebulia amonTxeuli qanebis andezitebisa da baz al t ebi s gamo f i t vi s pr o d uqt ebz e.

Savmiwa niadagebisaTvis damaxasiaTebelia humusovani horizontis didi sisqe da humus i s d i d i Semc vel o ba.

Savmiwa niadagebi sakmaod mdidaria karbonatebiT, romlis raodenoba zeda ho r i z o nt S i mc i r ea, magr am s i R r mi s mi xed vi T mni Svnel o vnad mat ul o bs .

Savmiwa niadagebi xasiaTdeba STanTqmis didi tevadobiT, rac gamo wveul i a humus i s , l ami s a d a ko l o i d ebi s d i d i S emc vel o bi T .

S avmi wa niadagebi umTavresad Tixa da Tixnari meqanikuri Sedgenilobisaa. Savmiwebs aqvs kargi struqtura, ris gamoc miuxedavad mZime meqanikuri Sedgenilobisa, es ni ad agebi d ad ebi T i f i z i kur i d a wyl o vani T vi s ebebi T gamo i r Cevi an.

zogan Savmiwa niadagebs Soris gvxvdeba sustad damlaSebuli da susti bicobiani

s axes xvao bebi .

Savmiwa niadagebi maRali nayofierebiT xasiaTdeba da intensiurad aris gamoyenebuli mravalwliani kulturebisa da sxvadasxva sasoflo-sameurneo mindvris kul t ur ebi s mo s ayvanad .

## aRmosavleT saqarTvelo

aR mo s avl eT saqar T vel o S i gamo yo f i l i a ni ad agebi s 4 z o na.

1. vel ebi s S avmi wa, wabl a d a naxevr ad ud abno s r uxi - mur a ni ad agebi s z o na;
2. vakeT a d a mT i s wi nebi s gar d amaval i s axi s t ye-vel i s a d a t yi s ni ad agebi s z o na;
3. mTa-t yeT a ni ad agebi s z o na;
4. mTa-md el o T a ni ad agebi s z o na .

**aRmo savl eT s aqar T vel os Savmi wa, wabl a, r uxi - mur a ni ad agebi s z o na.**

wabl a ni ad agebi T avi s i S ef er i l o bi T ems gavs ebi an mwi f e wabl i s f er s , ami t o m mi i R es

aseTi saxelwodeba. wabla niadagebi ufro Raribia humusiT, vidre Savmiwa niadagebi. humusis Sedgenilobis mixedviT es niadagebi iyofa Ria da muq wabla niadagebad. ukanaskneli ufro mdidaria humusiT da warmoadgens gardamaval stadias Savmiwa da wabl a ni ad agebs S o r i s .

wabla niadagebis mSTanTqavi kompleqsi mdidaria Ca d a Mg –iT, zogjer ki Na –T ac ,

rac iwvevs am niadagebis gabicobebas, STanTqmuli natriumisa da kaliumis arseboba wabla niadagebSi, rogorc niadagis koloidebis sust koagulatorebisa, gavlenas axdens niadagis struqturul Tvisebebze. wabla niadagebSi marcvlovani da koStovani struqtura aramtkicea, Zalian sustadaa gamoxatuli. aq ufro metad ganvi T ar ebul i a koStovani struqtura, romelic advilad mtvriandeba, xSirad ki es niadagebi us t r uqt ur o bi T xas i aT d eba.

wabla niadagebis meqanikuri Sedgeniloba ki saSualo Tixnaria. es niadagebi

umT avr es ad S esaZl ebel i a gamo yenebul i qnes mar c vl eul i kul t ur ebi s d asaT esad . wabla niadagebze Tu ganxorcieldeba swori agroteqnikuri RonisZiebebi S esaZl ebel i a sas o f l o -s ameur neo kul t ur aT a maRal i mo s aval i s mi R eba.

r u x i – m u r a ni ad agebi - es niadagebi wabla niadagebisagan gansxvavdeba,

humusis ufro mcire Semcvelobisaa da amitomac maT Ria Seferva axasiaTebT. humusis r ao d eno ba 2 %-md ea, r o mel i c s i R r mez e T and aT ano bi T kl ebul o bs .

humus i s S ed geni l o bi s mi xed vi T es ni ad agebi i yo f a- muq d a R i a mur a ni ad agebad.

mura niadagebis xsnaris reaqcia susti tutea, xolo qveda fenebSi tute. humusis

mc i r e S emc vel o bi sa d a S T anT qmul ko mpl eqs S i nat r i umi s kaT i o ni s ar s ebo bi s gamo , mur a niadagebis struqtura aramtkicea. struqturis simkvrive axasiaTebs humusiani fenis qveda nawils, mura niadagebTan SedarebiT. ruxi mura niadagebi tenis naklebobas ganicdian amitom pirvel rigSi aucilebelia mowesrigdes niadagis tenis sakiTxi . mo r wyvas T an er T ad s aWi r o a o r ganul mi ner al ur i s as uqebi s S et ana.

d a m l a S e b u l i niadagebi. damlaSebis xarisxis mixedviT niadagebi iyofa

sustad damlaSebul, saSualod, Zlier damlaSebul da bicobad. rasac safuZvlad udevs niadagSi advilad xsnadi marilebisa da qloris Semcveloba. rac ufro naklebia niadagSi advilad xsnadi marilebis raodenoba, miT ukeTesia niadagis agronomiuli Rirebuleba da piriqiT, rac metia marilTa raodenoba niadagi miT nakl ebi R i r ebul ebi saa.

niadagebis damlaSeba SeiZleba iyos zRviuri da kontinenturi warmoSobis. CvenSi arsebuli damlaSebuli niadagebi kontinenturi warmoSobisaa da gamowveulia gruntis wylebiTa da ferdobebidan Camonadeni mlaSe wylebiT. damlaSebis siRrmis mixedviT gamoirCevian zedapirulad da siRrmiT damlaSebuli niadagebi. niadagis damlaSebis siRrmes didi praqtikuli mniSvneloba aqvs niadagis gamoyenebis TvalsazrisiT da mo i T xo vs mel i o r ac i i s d r o s d i f er enc i r ebul mi d go mas . damlaSebuli niadagebi warmodgenilia biciani da bicobiani niadagebis saxiT. biciani niadagebi gvxvdeba ZiriTadad depresiul (dakavebul), axalgazrda reliefis elementebze, xolo bicobiani- SedarebiT Zvel, SemaRlebuli reliefis formebze. bicobiani niadagis damaxasiaTebelia meore horozontSi koloidebis dagroveba (STanTqmuli natriumiT), rac iwvevs mis Zalze did simkvrives mSral mdgomareobaSi, Zl i er webo vnebas d a wyal gamt ar o bas -t eni anS i . mlaSobi niadagebi metwilad gamouyenebelia. SedarebiT metad iyeneben bicobian

ni ad agebs , T u maT S i bi c o bi ano bi s xar i s xi Zal i an d i d i ar ar i s .

**aluviur niadagebs** saqarTvelos dablob zonaSi mniSvnelovani adgili ukavia. aluviur niadagebs uwodeben xeobis im farTobs, romelic periodulad ifareba wyaldidobis dros mdinaris kalapotidan gadmosuli wyl i T . es niadagebi gavrcelebulia, rogorc dasavleT ise aRmosavleT saqarTveloSi mdinareebis da Senakadebis sanapiroebze. aseTi tipis niadagebs qimiuri da meqanikuri Sedgenilobisa d a s xva T vi s ebebi s mi xed vi T d i d i mr aval gvar o ba axas i aT ebs .

dasavleT saqarTvelos aluviar niadagebs daWaobeba axasiaTebs. xolo aRmosavleT

s aqar T vel o s s t epur i nawi l i s amave ni ad agebs z o gj er s us t i d aml aS eba. meqanikuri Sedgenilobis mxriv aluviur niadagebs Soris vxvdebiT qviSebs, qvi S nar ebs , T i xebs d a agr eT ve xi r xat i an d a uxi r xat o s axes xvao bebs .

aluviur niadagebi susti mJavea, zog SemTxvevaSi es niadagebi qveda fenebSi

kar bo nat ebs S ei c aven.

saqarTvelos aluviuri niadagebi mcire gamonaklisis garda noyieria. al uvi ur i niadagebi ZiriTadad gamoiyeneba marcvlovani da bostneuli kul t ur ebi s aT vi s , qar T l i s r ai o nebS i - Saqr i s War xl i s a d a xexi l i saT vi s .

**vakeT a d a mT i s wi nebi s gar d amaval i saxi s t ye-vel i sa d a t yi s ni ad agebi s z o na;** am zonas miekuTvneba aRmosavleT saqarTvelos vakeebisa da mTiswinebis didi

nawili-Sua qarTlis bari, mosazRvre kavkasiis mTiswinebi, TrialeTisa da somxeTis mT ebi s mT i s wi nebi , kaxeT i sa d a gar e kaxeT i s mT i s wi nebi , al az ni s vake.

aRniSnul zonas faqtobrivad gardamavali adgili miekuTvneba velis zonasa da

mTa-t yeT a z o nas S i r i s .

vakeebis farglebSi aq Warbobs aluviuri karbonatuli da gardamavali saxis ruxi yavisferi niadagebi. mTiswinebSi ki ufro meti xvedriTi wiliT aris warmodgenili Savmiwisebri da tyis yavisferi niadagebi. alaznis velis marcxena napirze gavr c el ebul i a t yi s al uvi ur i ukar bo nat o ni ad agebi .

alaznis velis orove napirze farTod misdeven rogorc marcvelulis ise vazis, T ambaqo s d a s xva kul t ur ebi s war mo ebas . **mTa-tyeTa niadagebis zona.** mT a-tyeTa niadagebs aRmosavleT saqarTvelos mTian

nawi l S i mni S vnel o vani f ar T o bi ukavi a.

yvelaze meti mTa-mdeloTa niadagebis xvedriTi wili modis qarTlis, T i aneT i s ,

kaxeT i s a d a kavkas i o ni s s xva qed ebz e, samxr eT mT i aneT S i , T r i al eT sa d a mT ebz e.

t yi sa d a t ye-vel i ani z o nebi s gar d amaval nawi l S i umT avr esad gavr c el ebul i a t yi s

yavi sf er i ni ad agebi .

tyis zolis qvemo nawilSi, t ye-veliani zonis sazRvrebze gavrcelebulia tyis yavisferi niadagebi- Sida qarTlSi, Tbilisis midamoebSi, gare da Siga kaxeTis, T eT r wyar o S i , bo l ni s i s , d mani s i s a d a s xva r ai o nebS i .

**aRmosavleT saqarTvelos mTa-mdeloTa niadagebis zona.** mT a-mdeloTa niadagebi

aRmosavleT saqarTveloSi gavrcelebulia Siga qarTlis, duSeTis, yazbegis, TianeTis, T el avi s r ai o nebS i , kaxeT i s kavkas i o ni s maR al mT i an z o naS i .

subalpuri mdeloebis sartyelSi yvelaze mniSvnelovani adgili uWiravs kordian da kordian-torfian mTa – mdelos niadagebs. amasTan kidev mniSvelovan farTobebi uWi r avs t o r f i an mT a-md el o s ni ad agebs .

farTod aris gavrcelebuli alpuri-mdeloebis zonaSi mcire sisqis l o r d i an, t o r f i an d a sus t ad ganvi T ar ebul mT a-mdel o s ni ad agebi .

## samxreT saqarTvelo

samxreT saqarTvelos niadagur olqs axasiaTebs mniSvnelovani sxvadasxvaobani da niadagebis garkveuli zonaluri gavrcelebebi, romelic akad m.sabaSvilis mier daraionebulia Semd egi s qemi T :

1. samxreT saqarTvelos (axalcixis, qvabulis) vakeTa da mTiswinebis gardamavali s axi s (r uxi yavi sf er i ) d a t yi s yavi s f er i ni ad agebi s z o na;
2. mTa-t yeT a ni ad agebi s z o na;
3. samxreT saqarTvelos vulkanuri zegnebis, mTis Savmiwebisa da mdeloTa

ni ad agebi s zona;

1. mTa-md el o T a ni ad agebi s z o na.

1. samxreT saqarTvelos ( axalcixis, qvabulis) vakeTa da mTiswinebis gardamavali saxis (r uxi yavi sf er i ) d a t yi s yavi s f er i ni ad agebi s z o na; zonis niadagur safars gardamavali tye-velis saxe aqvs. qvabobis mTiswinebSi da vakeze umetesad gavrcelebulia gardamavali saxis ruxi-yavisferi da tyis yavisferi niadagebi.

t yi s yavi sf er ni ad agebz e aR ni S nul z o naS i gaaqt i ur ebul i a er o z i ul i pr o c es ebi .

maRal tyis zonaSi tyis yavisfer niadagebs cvlis yomrali da mTa mdeloTa niadagebi qvabobios fskersa da vakeebze vxvdebiT agreTve aluviur – karbonatul Tixnar ni ad agebs .

aRniSnuli zona mTlianad gamoiyeneba marcvleulis, xexilis, kartofilisa da bo s t neul i s s awar mo ebl ad .

## s amxr eT s aqar T vel os mT a-t yeT a ni ad agebi s z o na

aRniSnul zonaSi yvelaze metad gavrcelebulia mTa-tyeTa niadagebi. es niadagebi ZiriTadad ferdobebzea gavrcelebuli sadac eroziuli procesebis gamo sustad aris ganvi T ar ebul i d a d i d i s i s qe ar aqvs .

mniSvnelovani raodenobiT aris gavrcelebuli mTa-tyeTa zonis qveda zolSi tyisyavi sf er i ni ad agebi .

## s amxr eT s aqar T vel os mT i s Savmi webi s z o na

samxreT saqarTveloSi Savmiwebi ZiriTadad gavrcelebulia zegnebis vakeebze. Savmiwa niadagebis am zonaSi ganviTarebulia maRal mTiani mcenareulobis cxovelmyofelobis Sedegad, ZiriTadad bazaltis gamofitvis produqtebze da l i o s i s ebr T i xebz e.

Savmiwa niadagebidan arCeven: 1. karbonatul, 2. saSualo da 3. gamo t ut ul s . S avmi wa niadagebi umTavresad Tixa da Tixnari meqanikuri Sedgenilobisaa. Savmiwebs aqvs kargi struqtura, ris gamoc miuxedavad mZime meqanikuri Sedgenilobisa, es niadagebi dadebiTi fizikuri da wylovani TvisebebiT gamoirCevian da ZiriTadad gamo i yenebi an mar c vl eul i kul t ur ebi sa d a sakvebi bal axebi s mo sayvanad .

**s amxr eT s aqar T vel os mT a-md el o T a ni ad agebi s z o na.**

mTa-mdeloTa niadagebi samxreT saqarTveloSi mniSvnelovani raodenobiTaa

gavr c el ebul i am niadagebs aqvs saSualo sisqe, MZime Tixiani Sedgeniloba, kargad gamoxatuli

s t r uqt ur a d a humus i s d i d i S emc vel o ba javaxeTisa da walkis zeganze, maRalmTian zonaSi agreTve sustad ganviTarebuli

da Zlier qviani niadagebia farTod gavrcelebuli. mcire sisqis niadagebi, Zi r i T ad ad saTib-s aZo vr ad aa gamo yenebul i .

## mi webi s mel i o r ac i a

wyals niadagisaTvis udidesi mniSvneloba aqvs. wyalze damokidebulia niadagis

f i z i kur meqani kur i T vi sebebi , r o go r i c aa; bmul o ba, pl as t i kur o ba d a s i mkvr i ve.

niadagSi wyali sxvadasxa formiT gvxvdeba. esenia: orTqlisebri, higroskopiuli,

apki sebr i , kapi l ar ul i , gr avi t ac i ul i , magar i d a qi mi ur ad S ekavS i r ebul i .

higroskopiuli wyali adsorbcirebulia (STanTqmulia) niadagis nawilakebis mier, mas mc enar e i yenebs.

apkisebri wyali warmoadgens niadagis nawilakebze Semokrul, Txel apks, romelic SeboWilia molekularuli SeWidulobis ZaliT. kapilaruli wyali gravitaciul wyal T an er T ad mc enar i s kvebi s Zi r i T ad i mo mar agebel i a.

magari wyali niadagSi gvxvdeba yinulis saxiT qimiurad SekavSirebuli wyali Sedis

ni ad agi s mi ner al ebsa d a mar i l ebS i .

niadagis tentevadoba ewodeba mis unars miiRos da daakavosTavis sxeulSi wyl i s

gar kveul i r ao d eno ba.

arCeven niadagis tenianobis sam saxes udides anu srul tentevadobas, SefardebiTs

anu kapi l ar ul t ent evad o bas d a umc i r es anu abs o l ut ur t ent evad o bas .

udidesi an zedapiruli tentevadoba aris is mdgomareoba roca wyliT gavsebulia, yvela fori da naprali, aseTi mdgomareobaa Waobian adgilebSi aseve sxva niadagebSi Tovlis dnobis an xangrZlivi wvimebis dros. SefardebiTi anu kapilaruli wyaltevadoba niadagis iseTi mdgomareobaa, rodesac wyliT gavsebulia niadagis mxo l o d kapi l ar ul i f o r ebi .

umciresi anu absoluturi tentevadoba iseTi mdgomareobaa, rodesac wyali moTavsebulia agregatebis SigniT, kapilarebSi, nawilobriv agreTve agr egat ebS o r i s ebS i c d a mo Zr ao bs ni ad agS i gr avi t ac i ul -meni skur i Zal ebi T .

udidesi anu zRvruli tentevadobis dros niadags SeuZlia Seisrutos wylis mTeli raodenoba, romelic niadagis zedapirzea. am dros niadagi mTlianad gaJRenTilia da yvela misi forebi wyliTaa avsebuli. aseTi tenianoba niadags Cveul ebr i vad axas i aT ebs nal eqebi s S emd eg.

kapilaruli tentevadoba aris wylis is raodenoba romelsac niadagi isrutavs

kapilarebis ZaliT. wylis am raodenobas gansazRvravs niadagis kapilaruli forebi s r ao d eno ba.

maqsimaluri molekuluri tentevadoba ganisazRvreba wylis im raodenobiT, romelsac akavebs niadagi zedapiruli mizidulobis molekuluri ZalebiT, e.i. apki sebr i wyl i s r ao d eno bi T .

niadagis wyalgamtaroba aris niadagis Tviseba gaataros Tavis masaSi wyal i ,

romelic zedafenebidan qveviT Jonavs simZimis ZaliT. es ki damokidebulia niadagis meqanikur Sedgenilobaze, struqturasa da mis forianobaze. wyalgamtarobis didi unariT xasiaTdeba qviSa, niadagebi da struqturiani niadagebi. sustad gamtaria mZime Tixa niadagebi, wvril struqturiani niadagebi da sxva. niadagis wyalgamtarobis Seswavlas didi yuradReba eTmoba sarwyav niadagebSi, radgan rwyvis normis dadgena ami s mi xed vi T und a mo xd es .

niadagis kapilarobis unari ZiriTadad ganisazRvreba gruntis wylis donidan

amosuli wylis simaRliT da amosvlis siswrafiT. niadagis es Tviseba- swrafad aswios wyali, damokidebulia agreTve niadagis meqanikur Sedgenilobaze, struqturianobasa da f o r i ano baz e.

atmosferuli naleqebi, romelic niadagSi CaiJoneba, yvela rodia mcenarisaTvis S esaT vi s ebel i . ni ad agS i CaJ o ni l i wyl i s d i d i nawi l i i kar geba ao r T ql ebi T .

ni ad agi s t eni ano ba i c vl eba wel i wad i s d r o ebi s , T veebi sa d a d R eebi s mi xed vi T .

**niadagis wylis formebi**. niadagis tenis ramdenime klasifikacia arsebobs, maT Soris aRsaniSnavia lebedevis, dolgovis da sxva klasifikaciebi. a. rodes mixedviT niadagis wylis Semdegi kategoriebi arsebobs: kristalizaciuri, magari, orTqliseburi, mWi d r o d bmul i , f aS ar ad bmul i d a T avi s uf al i .

wyali niadagSi moipoveba misTvis damaxasiaTebel samive fizikur mdgomareobaSiTxevadi, orTqlisebri da myari. aqedan mcenarisaTvis misawvdomia, mxolod Txevadi wyali.

wylis r eJ i mi s mowesrigebisaTvis saWiroa vicodeT wylis maragi niadagSi ama Tu im R o ni s Zi ebi s Cat ar ebi s wi n. es mar agi S emd egi f o r mul i T i angar i S eba (ha-z e):

*w*.*dh*

*p*10

1. ad ac P ar i s wyl i s mar agi (mm-o bi T ) ni ad agi s mo c emul f enaS i .

w-am f eni s t eni ano ba (%-o bi T ) mS r al i ni ad agi s mas i s mi mar T . d-ni ad agi s mo c ul o bi T i mas a (g/s m3 ).

h- ni ad agi s f eni s s i s qe (s m).

magaliTad, Tu niadagis tenianoba udris 15%, niadagis moculobiTi masa 1,2. xolo gamo kvl eul i f eni s s i sqe 50 sm, maS i n f enaS i ha-z e i qneba:

*w*.*d*.*h* 15.1,2.50 3, e.i. 50 sm- ze. *p*   90mm-s , anu 900 m

10 10

wylis maragi Seadgens 90 mm-s anu900 m3, ase rom mocemuli niadagis umciresi

1. ent evad o bamd e d as at eni anebl ad , r o mel i c vT qvaT , 30%-s udris da r ac , amave f o r mul i T rom gaviangariSoT, Seadgens 180 mm, anu 1800 m3, wylis saWiro raodenoba iqneba: 1800 m3- 900 m3 = 900 m3 heqtarze.

**wylis reJimi da mcenareTa produqtiuloba morwyvis pirobebSi.** mo r wyva

xo r c i el d eba im raionebSi, sadac meti sinaTle da siTboa. aq niadagis nayofiereba sakmaod didia, magram mcenare ver iyenebs am xelsayrel pirobebs Tavisi zrdaganviTarebisaTvis, radgan aq xelsayrel pirobebs Tavisi zrda-ganviTarebas mivaRwioT mo r wyvi s saS ual ebi T .

**wylis monawileoba mcenaris zrda-** ganviTarebis procesebSi. rogorc aRvniSneT, wyali monawileobs mcenaris zrda-ganviTarebis yvela procesSi-sakvebi elementebi ixsneba wyalSi da masTan erTad gadadis mcenaris foTlebSi; foTlebisagan yvela o r gano S i wyal T an er T ad gad ad i s e.w. pl as t i kur i ni vT i er eba, r o ml i s ganac war mo i qmneba axali ujredebi, mcenaris foTlebSi mimdinareobs metad mniSvnelovani procesifotosinTezi, sadac monawileobas Rebulobs wyali da mis gareSe mcenareSi ver warmoiqmneba Saqrebi; foToli es is laboratoriaa, sadac xdeba araorganuli nivTierebis qimiuri gardaqmnebi da sruldeba mosamzadebeli procesebi mosavlis d agr o vebi saT vi s .

**wylis odenoba da mdgomareoba mcenareSi.** mcenareSi naxevarze meti wyalia. n. maqs i mo vi s mi xed vi T , f o T l ebS i wyal i uf r o met i a (80-90%), vi d r e f es vebS i (70-80%).

mcenareSi wyali Sedis sxvadasxva formiT, is sxva qimiur naerTebTan erTad Sedis mcenaris WurWlovan sistemaSi, ujredis sxvadasxva nawilSi, wyali aZlevs maT moZraobis unars, rasac wylis struqturuli mdgomareoba ewodeba; wylis erTi nawili aorTqldeba mcenaris ujredis zedapiridan ujredSorisebSi da is orTqlisebr mdgomareobaSia; mcenaris sxvadasxva organoSi Sedis e.w. moZravi wyali, romelic mniSvnelovan rols asrulebs mcenaris normalur cxovelmyofelobaSi (nivTierebaTa c vl aS i ) d a pr o d uqt i ul o baS i .

mcenaris sicocxleSi did rols asrulebs bmuli wyali. mcenaris ujredebis Tvisebas, winaaRmdegoba gauwios mcenareebidan wylis dakargvas, wylis Sekavebis unar i ano ba ewo d eba.

niadagis arasakmao tenianobis dros irRveva wylis reJimi mcenaris rogorc miwiszeda, ise miwisqveSa (fesvebi) nawilebSi. mniSvnelovnad mcirdeba fesvebSi fosforis Semcveloba. mcenaris wyliT normaluri uzrunvelyofisas fesvebSi daubrkolebriv mimdinareobs organuli fosforis sinTezi. morwyva xels uwyobs mcenaris yvela organos gawylianebas da myardeba xelsayreli pirobebi o r ganul i ni vT i er ebebi s s i nT ez i saT vi s .

**transpiracia da misi mniSvneloba mcenarisaTvis.** mcenare niadagidan fesvebis saSualebiT STanTqmuli wylis raodenobidan SeiTvisebs mxolod 0,15-0,20%-s, danarCeni nawili orTqldeba foTlebidan da sxva organoebidan, am movlenas transpiracia ewo d eba transpiraciis sidide ZiriTadad ganisazRvreba kulturisa da jiSis biologiuri T avi s ebur ebebi T , agreTve mcenaris zrda ganviTarebis sxva faqtorTa mdgomareobiT da atmosferos haeris absoluturi tenianobiT, niadagis tenianobiT da sxva. mag. transpiraciis koeficienti 1 g mSrali nivTierebis Sesaqmnelad YT avT avi ani kulturebisaTvis saSualod 400-500 erTeulia, samyuras, ionjas, kartofilis 600-700. jiSebis mixedviT es maCvenebeli SeiZleba Seicvalos met-naklebad. t r anspi r ac i i s meSveobiT xorcieldeba: 1. transpiracis meSveobiT ganuwyvetliv mimdinareobs mcenaris mier niadagidan wyli SeTviseba. 2. wyalTan erTad mcenare iwovs masSi gaxsnil mineralur marilebs da gadaadgildeba mcenareSi. 3. transpiracia icavs foTlebs gagrilebisa da gadaxurebisagan .4. gadaWarbebuli transpiraciis dros Usasargeblod ar i xar j eba wyal i .

## mcenaris tenmoyvaruloba da gvalvagamZleoba. sxvadasxva sasoflo-s ameur neo

kulturebi wylis erTnairi moTxovnilebiT ar xasiTdebian, SedarebiT niadagis maRaltenianobas moiTxovs brinji, bostneuli kul t ur ebi , mdelos balaxebi, pureulebisaTvis SedarebiT didi tenianoba ar aris saWiro. gvalvaamtan kulturebs SeuZlia kargad gamoiyenos morwyvis dros damatebiTi teni da mogvces maRali mosavali. aqac mosavlis mateba morwyvis gavleniT cvalebadobs jiSebis mixedviT. am mxr i v s aWi r o a S ei r Ces j i S ebi ad gi l o br i v-s ameur neo pi r o bebi s mi xed vi T .

mcenaris produqtiulobis gadidebis uzrunvelsayofad saWiroa gamoyenebul iqnes rogorc mcenaris biologiuri Taviseburebani da kulturis jiSis mgrZnobiaroba mo r wyvi s ad mi , i s e mo r wyvi s r eJ i mi s a d a agr o t eqni kur i R o ni s Zi ebebi s d ac va.

**mcenareTa mier wylis xarjvis kritikuli periodebi.** mcenares wyali Wirdeba Teslis gaRivebidan nayofis momwifebamde. vegetaciis dasawyisSi mas SedarebiT cota wyali Wi r d eba.

wylis simcire mcenaris ganviTarebis mTel periodSi mkveTrad amcirebs kulturis mosavlianobas. mcenareTa cxovrebaSi gamoiyofa SedarebiT mokle periodi romlis drosac tenis nakleboba gansakuTrebiT mkacrad iwvevs mosavlis Semcirebas. am periodSi teniT sakmao uzrunvelyofa ki iZleva maRal mosavals. mcenaris zrda ganviTarebis am periods kritikuli periodi ewodeba. sxvadasxva mcenares es periodi s xvad as xva aqvs .

**ni ad agi s wyal i d a wyl i er i T vi s ebebi .**

niadagSi wylis Sewova an inflitracia, naleqebidan iqneba es Tu sarwyavi wilidan, damokidebulia niadagis forebze Tu niadagis wvril forian niadagSi (ustruqturo) wyali Znelad iJoneba, xolo msxvilforianSi wyali (struqturiani) advilad SeiJoneba d a s i mZi mi s Zal i T s wr af ad xd eba mi s i mo Zr ao ba z emo d an qvemo T .

ni ad agi s md go mar eo bas , r o d esac yvel a f o r i amo vs ebul i a wyl i T , s r ul i t ent evad o ba

ewodeba (st). es iangariSeba %-iT an milimetrobiT absoluturad mSral ni ad agS i . niadagis tenianoba 100%-iT iSviaTia da xdeba mxolod araxangrZlivi gamudmebuli wvimebis, Tovlis dnobis an morwyvis dros; rogorc ki wyali amoavsebs forebs, wyal i midis qvemo fenebSi da zemo fenaSi rCeba wylis imdeni maragi, ris Sekavebac ar SuZl i a ni ad ags T avi s mas aS i .

wylis udidesi raodenoba, romelic Sekavebulia niadagiT qvemo fenaSi CauSvebl ad , zRvruli tentevadoba ewodeba (zt), romelic damokidebulia ara mart o niadagis Tvisebebze, aramed gruntis wylis doneze. rodesac wyali did siRrmezea, niadagis zemo fesvTa sistemis gavrcelebis zona, romelic datenianebulia zRvruli mi nd vr ul i t eni ano bi T , ar S ei c avs i md en t ens , r o m mas s i mZi mi s Zal i T S eeZl o s mo Zr ao ba zemodan qvemoT. Tu gruntis wyali axloa niadagis zedapirTan, niadagis zRvruli mi nd vr ul i t ent evad o ba d i d d eba.

sruli da zRvruli mindvrul tentevadobas didi mniSvneloba aqvs sarwyav miwaTmoqmedebaSi. saWiroa morwyvis win sworad dadgindes niadagis tenianoba, rom mo r wyvi s d r o s i gi i yo s z R vr ul i mi nd vr ul i t ent evad o bi s d o nemd e.

niadagis Tvisebas gasces wylis nawili dinebis gziT simZlavris moqmedebis ZaliT zemodan qvemo fenebSi, wyalgacema ewodeba (wg), amas ufro metad vxvdebiT, rodesac gruntis wyali did siRrmezea niadagis zedapiridan. mas maqsimaluri wyalTgacema ewo d eba (mwg). ni ad agi s f eni s s i Rr mi s gad i d ebi T wyal gac ema T and aT an mc i r d eba.

niadags, misi formebis xasiaTisa da meqanikuri Sedgenilobis mixedviT aqvs agr eT ve

wyalamowvevis unarianoba (wa), romelic sxvadasxva xarisxiT mJRavndeba. ramdenadac ni ad agi s f o r ebi wvr i l i a, i md enad es T vi seba Zl i er i a (T i xebi , mZi me T i xebi ).

wyalamowevis unarianobis sidide SeiZleba ganisazRvros datenianebuli fenis siRrmiT, romelic imyofeba gruntis wylis donis zemoT, saidanac gruntis wylis amo weva xd eba qvemo d an z emo T kapi l ar ebi s s aS ual ebi T . ami t o m am f enas kapi l ar ul i S r e ewodeba. niadagis wyalamowevis unarianobis meSveobiT mcenares SeuZlia gamoiyenos gruntis wyali.

gruntis wylis siaxlovem niadagis zedapirTan SeiZleba gamoiwvios niadagis

daWaobeba da damlaSeba, amitom aseTi niadagebi frTxilad unda moirwyas (r wyvi s no r mebi s S emc i r eba d a sxva).

niadagis wylier Tvisebebs ekuTvnis agreTve Txieri da orTqlisebri wyl i s S ekavS i r eba. ni ad agi s nawi l akebs unar i aqvs S eakavo s r amd eni me mo l ekul a T xi er i wyal i , r o mel sac qi mi ur ad d akavS i r ebul i , anu bmul i , wyal i ewo d eba. mc enar e mas ver i T vi s ebs ni ad agi d an. nawilakebs unari aqvs agreTve Tavis garSemo zedapiruli daWimulobis ZaliT Seakavos Txieri wylis apki, romelsac apkisebri wyali ewodeba da mcenare mas ver iTvisebs. niadagis unars, STanTqas da Seakavos orTqlisebri wylis molekulebi, ni ad agi s hi gr o s ko pi ul o ba ewo d eba. o r T ql i s ebr i wyl i s ud i d es r ao d eno bas , r o mel s ac niadagi STanTqavs, maqsimaluri higroskopiuloba ewodeba (60-80% higroskopiuli wyali). niadagis es tenianoba ver akmayofilebs mcenaris moTxovnilebas wyalze da ami t o m mas Wkno bi s ko ef i c i ent i ewo d eba.

## mc enar eT a mi er wyl i s xar j va

agronomiuli TvalsazrisiT niadagSi wyali imyofeba Tavisufali, bmuli da orTqlisebri formebiT. Tavisufal wyals, romelic msxvil forebSia ewodeba gravitaciuli wyali, mcenarisaTvis ufro xelmisawvdomia, magram mas ufro gansazRvruli mniSvnel oba aqvs mcenaris wyalmomaragebaSi, radgan zemodan qvemoT swrafi moZraobis gamo fesvTa sistemis gavrcelebis fenidan Cqara Caedineba qvemo fenebSi.

wyali, romelic niadagis wvril (bewva) forebSi, anu kapilarebSia, **kapilaruli wyali ewodeba** da igi yvelaze metad xelmisawvdomia mcenarisaTvis, misi moZraoba damokidebulia am wvrili kapilarebis sidideze. Zlier wvril forebSi es wyali bmuli formiTaa da mcenare mas ver iTvisebs. ufro msxvil kapilarul forebSi, kapi l ar ul i wyali zemodan qvemoT kargad moZraobs, gansakuTrebiT gruntis wylis Rrmad arsebobis d r o s d a mc enar e mas kar gad i T vi s ebs .

niadagis agregatis Sida kapilarebSi arsebuli wyali ar aris moZravi da Sekavebulia niadagis mier, imis miuxedavad, Tu gruntis wyali ra donezea niadagis zedapiridan. am wyals **kapilaruli dakiduli wyali ewodeba** da mcenare ver iTvisebs, r ad gan i s apki s ebr i wyl i s md go mar eo baSi a, r o mel i c apki s s axi T gar s er t ymi s ni ad agi s meqanikur nawilakebs zedapiruli daWimulobis ZaliT da gvxvdeba myari da fxvieri bmul i wyl i s f o r mi T .

zogjer apkisebri wylis periferiuli nawili nakleb bmul mdgomareobaSia da mcenares SeuZlia nawilobiv misi gamoyeneba. es wyali moZraobs ufro gamomSrali niadagis mxarisaken, magram es moZraoba Cerdeba niadagis gansazRvruli tenianobaze, r o mel sac kapi l ar ul i kavS i r i s S ewyvet i s t eni ano ba ewo d eba (kkS )

**orTqlisebri wyals** mcenare ver iyenebs, magram is SeiZleba iyos wylis sxva formebis wyaro, romelTac mcenare iyenebs (rodesac is gadadis Txier formebSi). orTqlisebri wyali moTavsebulia haerTan erTad niadagis msxvil arakapil ar ul f o r ebS i , haer i am d r o s o r T ql i T maZR ar i a.

i m f enas , s ad ac gavr c el ebul i a mc enar i s wvr i l i , bus us a S emwo vi f esvebi s 90%, md i d ar i a sakvebi el ement ebi T , wyl i T d a d asaxl ebul i a sas ar gebl o mi kr o o r gani z mebi T ,

aqt i ur i f ena ewo d eba**.**

niadagis aqtiuri fena icvleba mcenaris ganviTarebis fazebis mixedviT. fena zeda

nawilSi teniandeba savegetacio rwyviT, xolo qvemo nawilSi teniandeba savegetacio mo r wyvamd e Cat ar ebul i s amar ago r wyvi s xar j z e.

mcenareSi wylis Sesvla da sakvebi nivTierebebis gaxsna rTuli biologiuri pr o c es i a, ZiriTadad is xdeba wvrili bususa fesvebis ujredebis Sewovis ZaliT da ujredis wvenis osmosuri wneviT, Sewovis Zala da osmosuri wneva sxvadasxva mcenares sxvadasxva aqvs. ramdenadac metia niadagSi wyali da metia misi raodenoba mcenaris qsovilebSic- o s mo s ur i wneva d a Sewo vi s Zal a uf r o nakl ebi a.

rodesac niadagSi mcire wyalia, foTlebisa da fesvebis Sewovis Zala Zlierdeba, magram amave dros matulobs niadagis mier wylis Sewovis (Sekavebis) Zalac. mcenare uf r o i nt ens i ur ad S T anT qavs wyal s o pt i mal ur i t eni ano bi s d r o s .

mcenareSi wylis moZraobis unari mkveTrad mcirdeba niadagis umciresi tenianobis 60-70% dros, rodesac iwyeba kapilarebis kavSiris Sewyvetis tenianoba. es tenianoba axl o s d gas **mc enar i s z r d i s Senel ebi s t eni ano bas T an**.

rodesac niadagSi mcenarisaTvis SesaTvisebeli wylis maragi amoiwureba, iwyeba

mc enar i s myar i Wkno bi s t eni ano ba.

niadagidan tenis xarjva transpiraciiT da niadagis zedapiris mier aorTqlebis gz i T , **SejamebiTi (jamuri) wyalxarjvaa**. amas metad didi mniSvneloba aqvs soflis meurneobis warmoebisaTvis. radgan is gamoxatavs namdvil garemos, sadac mJRavndeba ni ad agi s a d a mc enar i s wyl i s r eJ i mi . wyl i s xar j vi s wyar o ebi :

* ni ad agi s bunebr i vi t eni .
* nal eqebi .
* s ar wyavi wyal i .
* gr unt i s wyal i . **wyal xar j vi s ko ef i c i ent i :** mc enar i s veget ac i i s per i o d S i S ej amebi T i wyal xar j vi s s i d i d e m3 1 ha-z e gavyo T mi R ebul i mo s avl i s r ao d eno baz e (c /ha). wyal xar j vi s ko ef i c i ent i c val ebad i a d a i c vl eba agr o t eqni ki s a d a met eo r o l o gi ur i pi r o bebi s Sesabamisad.

**rwyavi reJimi** sarwyavi wylis efeqti damokidebulia imaze, rom rwyva Catardes gansazRvrul vadebSi, romelic unda Seesabamebodes mcenaris biologiur

T avi s ebur ebasa d a z r d a-ganvi T ar ebi s gar emo pi r o bebs .

T i T o eul i r wyvi s d r o s und a d ad gi nd es : \* r wyvi s no r ma (1 ha-z e wyl i s saWi r o r ao d eno ba) \* Sei r Ces wyl i s ef eqt i ani wes i .

ama Tu im kulturis gegmiur morwyvas savegetacio periodis ganmavlobaSi rwyvis

reJims uwodeben. mag. saS. xorblis morwyvis erT-erTi variantia: 1. T es vi s wi na mo r wyva z o l ebS i mi S vebi T seqt ember -o qt o mber S i , r wyvi s no r ma 500 m3.

1. savegetacio rwyva zolebSi miSvebiT mcenaris aRerebis fazaSi, niadagis 70% tenianobisas, zRvruli mindvruli tenianobis mixedviT (zmt), rwyvis norma 400 m3 1 haze.
2. savegetazio rwyva zolebSi miSvebiT mcenaris daTavTavebis win, niadagis 75% t eni ano bi sas (z mt ), r wyvi s no r ma 500 m3 1-ha-ze
3. saveget ac i o r wyva z o l ebS i mi Svebi T mc enar i s mar c vl i s Cas axvi sas ;
4. ni ad agi s 75% t eni ano bi s as (z mt ), r wyvi s no r ma 500 m3 1-ha-z e
5. sarwyavi no r ma (Tesviswina rwyvis gareSe) Seadgens 1400 m3 1 heqtarze, TesvisTanave r wyvi T ki 1900 m3 1-ha-z e.

srwyavi reJimis ukeT dasadgenad saWiroa TiToeuli kulturisaTvis dadgindes

ni ad agi s r wyvi s wi na t eni ano ba

Cveulebriv, mcenaris zrda-ganviTarebis periods d a vegetaciis vadebs sam per i o d ad yo f en:

1. d asawyi s i , kr i t i kul per i o d amd e,
2. kritikuli,
3. z r d a-ganvi T ar ebi s d as as r ul i

rwyvis wina tenianobis done damokidebulia niadagisa da amindis pirobebze. rwyvis

wi na t eni ano bi s d ad gena l abo r at o r i ul i anal i z i s meT o d i T xd eba.

rwyvis normis dasadgenad, garda rwyviswina tenianobisa, didi mniSvneloba aqvs

niadagis dasatenianebeli fenis siRrmis codnas, rogorc vi c i T , r wyvi T at eni aneben niadagis aqtiur fenas, sadac gavrcelebulia kulturis fesvTa sistemis Semwovi f esvebi s umet es i masa.

**wyalxarjva da sarwyavi norma.** wylis is raodenoba, romliTac mcenare kmayofildeba mTeli vegetaciis periodSi sarwyavi wyliT, sarwyavi norma ewodeba. aqedanac cxadia, rom is aris mTeli vegetaciis ganmavlobaSi Catarebuli rwyvis dros 1 heqt ar z e d axar j ul i wyl i s j ami mm-i T .

sarwyav normas ufro metad adgenen specialuri institutebi da sacdeli

s ad gur ebi s as o f l o **-**sameur neo kul t ur ebi s aT vi s s ar wyavi r eJ i mi s S es wavl i s d r o s .

sarwyavi wyali avsebs wylis im danakliss, romelic saWiroa kulturuli mcenaris normaluri zrda- ganviTarebisaTvis, amitom Tu gvecodineba wyalxarjvis normaluri sidide da mcenaris bunebrivi wyalmomarageba, SeiZleba gamoviangariSoT sarwyavi norma S emd egi f o r mul i T : M0 = E –O-(B –b) –Gg sadac : M0 aris sar wyaviwyl i s no r maa m3/ha;

E –Sej amebul i wyal xar j va m3/ha veget ac i i s per i o d S i ;

O –s as ar gebl o nal eqebi s j ami m3

B- ni ad agi s t eni s mar agi m3/ f es vT a s i s t emi s gavr c el ebi s f enaS i T es vi s d r o s . b- i mave mo savl i s aR ebi s d r o s wyl i s naS T i ni ad agS i ; g –wyl i s r ao d eno ba, r o mel i c mc enar em gamo i yena gr unt i s wyl i d an.

mcenaris mier gruntis wylis SeTviseba-gamoyeneba damokidebulia siRrmeze, gruntis

meqani kur S ed geni l o baz e, wyl i s mi ner al ur S emc vel o baz e, kul t ur az e d a s xva

**r wyvi s s pec i al i z ac i a s ameur neo d ani Snul ebi s mi xed vi T r wyvi s wes ebi , maT i**

**agroteqnikuri Sefaseba.**

sarwyavi sistema, anu rwyvis reJimi, calkeuli kulturis Sesabami s ad , i T val i s wi nebs

sxvadasxva sameurneo daniSnulebis, anu sxvadasxva specializaciis, rwyvas. sameurneo daniSnulebis mixedviT rwyva SeiZleba iyos: 1. samarago, 2. xvni s wina. 3. gamo r ec xvi T i anu niadag gamwmendi, 4. Tesviswina an dargviswina, 5. damatebiTi Tesvis an dargvis S emd eg d amat ebi T , 6. s aveget ac i o d s xva.

1. samarago, anu niadagis tenmomaragebis. rwyva warmoebs sasoflo-s ameur neo kulturebis Tesvamde an mravalwlovani kulturis aqtiuri vegetaciis Sewyvetis Semdeg, samarago rwyvis daniSnulebaa gaadidos tenis maragi niadagis fesvTa sistemis gavr c el ebi s f enaS i mc enar eT a saveget ac i o per i o d i saT vi s.

samarago rwyva mizanSewonilia Catardes iq, sadac Semodgoma-z amTris periodSi arasakmao naleqia, rom am SemTxvevaSi fesvTa sistemis gavrcelebis fena dateniandes z R vr ul mi nd vr ul t eni ano bamd e (z mt ).

samarago rwyva Zalian mniSvnelovania sagazafxulo adreul da im kulturebisaTvis, romelTa fesvTa sistema Rrmad viTardeba niad agSi: simindi, pomidori, (TesviT), War xal i , i o nj a, xexi l i d a s xva.

1. xvniswina rwyvas zogjer mimarTaven maSin, rodesac xvnamde gamomSralia niadagis saxnavi fena (ar aris simwifis mdgomareobaSi). misi mizania daatenianos niadagi da Seqmnas xelsayreli pirobebi xarisxovani xvnisaTvis, xvniswina rwyvis norma SeiZleba gad i d d es , r aT a Seas r ul o s samar ago r wyvi s f unqc i ebi c .
2. Tesviswina an dargviswina rwyvis amocanaa, daatenianos niadagis saxnavi da qvesaxnavi fena da miRebul iqnes Tanabari aRmonaceni, xeli Seuwyos dargul CiTils wyl i T s ar gebl o bi saT vi s .
3. damatebiTi rwyva tardeba Tesvis an dargvis Semdeg 20-30 sm siRrmeze drouli da Tanabari aRmonacenis misaRebad an bostneuli kulturebis darguli CiTilebis meti r ao d eno bi T gasaxar ebl ad .
4. gamorecxvis an niadagTgasufTavebis rwyvas iyeneben niadagSi xsnadi mavne marilebis (NaCl. NaCO3, Na2SO4,) gamosarecxad. amas sxvanairad sadrenaJo rwyvasac uwodeben.
5. savegetacio rwyvas atareben mcenaris zrda-ganviTarebis (vegetaciis) periodSi, rom uzrunvelyofil iqnes mcenare saWiro wylis moTxovnilebiT aRmocenebidan nayo f i s mo c emamd e.
6. damatebiTi gamokvebis rwyvas iyeneben naTes-nargavebis vegetaciis periodSi. damatebiTi gamokvebis dros Sesatanad gankuTvnili sasuqebi, umetesad mineraluri, jer moibneva naTesSi niadagis zedapirze mwkrivTSorisebis kultivaciis win da Semdeg mohyveba rwyva. an sasuqebis Sesatani norma SeiZleba gaixsnas wyalSi saTanado koncentraciiT (0,2-0,3) da Semdeg specialuri gamomkvebi manqaniT rwyvis saxiT Setanil i qnes ni ad agS i (es xd eba uf r o met ad ur wyav nakveT ebz e).
7. gamagrilebeli rwyva tardeba dawvimebiT, romlis mTavari amocanaa masSi gafantuli wylis Sxefebis saSualebiT win aRudges haeris gavlenas. es rwyva adidebs haeris absoluturi tenianobas da amcirebs haeris tenianobas. garda amisa dawvimebi T i morwyvi s d r o s wvi mi s wyl i T i r ec xeba f o T l ebi mt vr i s agan.
8. saprovokacio rwyva tardeba xvnis win. morwyvis Sedegad teniandeba niadagis is fena sadac sarevelebis Teslebia. niadagis datenianebis Sedegad xdeba maTi aRmoceneba, r o ml ebs ac S emd eg spo ben ni ad agS i CaxvniT.

**morigi savegrtacio rwyvis vadebis gansazRvris meTodebi.** rwyvis vadis dadgenis standarts niadagis tenianobis gansazRvra warmoadgens. es meTodi rom gamoviyenoT, saWiroa cdebis saSualebiT winaswar ganvsazRvroT tenianobis Semcirebis zRvari, romelic mosavlis mniSvnelovan zarals ar iwevevs. optimaluri tenianobis es qvemo z R var i saWi r o a mo r i gi r wyvi s d awyebi s aT vi s .

rwyviswina tenianobas adgenen aqtiuri fenisaTvis da radgan misi siRrme icvleba mcenaris zrda-ganviTarebis fazebis mixedviT, misi tenianoba vegetaciis periodSi moiTxovs rwyvis sxvadasxva normas. am meTodiT sakmaod srulyofilad xdeba mcenaris wyalmomaragebis gansazRvra, magram misi gamoyeneba moiTxovs sistematiur Tvalyurs niadagis tenianobaze, masTan rwyviswina tenianobas gamoxataven sxvadasxva maCveneblebiT: procentobiT mSrali niadagis wonidan misi mindvruli tentevadobidan da sxva.

aRniSnuli meTodiT niadagis rwyviswina tenianobis dadgenasTan erTad niadagis

gamoSrobiT, amJamad muSavdeba niadagis tenianobis gansazRvris daCqarebiTi meTodebi- - eleqtro nul i , r ad i aqt i ur i gamo s xi vebi s meT o d i d a s xva.

warmoebis pirobebisaTvis tenianobis gansazRvrisas sakmaod damakmayofilebel Sedegs iZleva niadagis 30-40 sm fenidan aRebul nimuSSi tenianobis raodenobis gansazRvra. es aqtiuri Sua nawilia da misi maCveneblebi tenianobis mxriv arsebiTad S eesabameba aqt i ur i f eni s t eni ano bas .

rwyviswina tenianobis gansazRvrisaTvis arsebobs specialuri stacionaluri mo wyo bi l o bani , romelebic ganuwyvetliv aRricxaven niadagis tenianobas. Semcirebis SemTxvevaSi avtomaturad CairTveba dawvimebis mowyobilobisa an sxva manqanebis muS ao ba.

farTod aris gavrcelebuli rwyvis vadebis dadgena mcenaris zrda-ganvi T ar ebi s

fazebis mixedviT,romlis drosac icvleba moTxovnileba wyalze. am meTodiT rwyvis dawyebis vadis gansazRvrisaTvis winaswar adgenen morwyvis sistemis kalendarul vadebs, romlebic Seesabameba mcenaris ganviTarebis fazebs. winaswar Sedgenili morwyvis grafiki SeiZleba aRmoCndes ara zusti klimaturi pirobebisa da agr o t eqni kuri pirobebis gamo (Tesvis vadebis gadaweva) ganviTarebis fazebis gad awevi T ac .

savegetacio rwyvis dawyebis vadis gansazRvrisaTvis maRal S ed egs iZleva rwyvis

diagnostikis biologiuri meTodi. es iTvaliswinebs mcenaris arsebul mdgomareobas wyliT uzrunvelyofis mxriv. amisaTvis iyeneben mcenaris garegnul Sexedulebas (foTlebis feris Secvla, vegetaciuri nawilebisa da produqtiuli organoebis zrdis daCqareba, foTlis turgoris darRveva) da mcenaris fiziologiur mdgomareobas (foTlebis Sewovis Zala, foTlis bageebis gaxsna da sxva. magram zogjer am meTods s i z us t e akl i a. magr am mi uxed avad am nakl i s a war mo ebaS i xS i r ad i yeneben.

garda zemoT CamoTvlili rwyvis vadis dadgenis meTodebisa arsebobs kidev sxva

meT o d ebi c .

morwyvis dros meur neo bi s saS ual o uz r unvel yo f a wyl i T S ei Zl eba gamo angar i S ebul

iqnes hidromoduliT, rac niSnavs wylis saSualo raodenobas, miwodebuls 1 wamSi litrobiT erT heqtar sarwyav farTobze, aq CaiTvleba morwyva Ramis drosac. saerTod, s ar wyavi wylis racionalurad gamoyenebisaTvis rwyvis Catareba unda warmoebdes d i l i T d a R ami .

rwyvis Catarebis mimdinareobis gegma yovelwliurad zustdeba amindis, kulturaTa

md go mar eo bi s , ni ad agi s t eni ano bi s d a s xv.mi xed vi T .

**r wyvi s wes ebi , maT i agr o t eqni kur i Sef as eba**

Tanamedrove sarwyavi miwaTmoqmedebis pirobebSi ZiriTadad rwyvis sami wesia miRebul i . 1. zedapiruli rwyva- sarwyavi wyali TviTdinebiT nawildeba niadagis zedapirze da STainTqmeba niadagis fenebSi. 2.. dawvimebiTi rwyva- specialuri dasawvimi aparatiT wvimismagvarad wylis SxefiT sveldeba mosarwyavi farTobi. 3. qveniadaguri r wyva- niadagis gansazRvrul siRrmeSi (40-60sm) Cayrilia naCvretebiani milebi da niadagis am siRrmis datenianeba xdeba naCvretebidan gamosuli wylis SesrutviT ni ad agi s mi er .

1. z ed api r ul i r wyva. r wyvi s es wes i met ad gavr c el ebul i a.

r wyvi s teqnikisa da niadagSi wylis Sesvlis xasiaTis mixedviT, arCeven zedapiruli

1. wyvi s S emd eg saxeebs: r wyvas kvl ebS i , z o l ebS i d a d at bo r vi T .

kvlebSi rwyvis teqnikis Taviseburebaa is, rom kvalSi uSveben wyals da misi moZraobis dros teniandeba mcenaris fesvTa sistemis gavrcelebis niadagis fena. am SemTxvevaSi teniandeba kvlebSorisi farTobi. wylis SeJonva gverdiTi filtraciiT xdeba.

kvlebSi rwyvas iyeneben saToxni kulturebisaTvis da agreTve mravalwliani

xexi l o vani kul t ur ebi s aT vi s .

kvalSiSi miSvebiT d r o s kvlebi gahyavT saToxni kulturebis mwkrivTSorisebSi niadagis bunebrivi daxrilobis mimarTulebiT, kvlebis siRrme 8-25 sm-ia, wyali T avi s uf l ad mi d i s kvl ebS i d a T anabr ad t eni and eba.

1. **as of l o s ameur neo kul t ur ebi s T es va-mo yvana l i manur i r wyvi s pi r o br bS i**

limanuri (limani zRvis yure) rwyva datborebiT rwyvis yvelaze martivi saxea. dasatboreblad iyeneben gazafxulze Tovlis dnobis, wvimebisa da adgilobrivi md i nar eebi s wylebs (wyaldnobis dros). Mmcire drois manZilze Sromis mcire danaxarjebiT SesaZlebeli xdeba moirwyos didi farTobebi da amitom es rwyva metad i af i R o ni s Zi ebaa.

limanuri rwyva mxolod gazafxulze tardeba erTxel da isic, rogorc samarago rwyva. rwyva araxangrZlivia. mTeli vegetaciis periodSi savegetacio rwyvas ar iyeneben. Aamitom datborebiT morwyva ar xerxdeba. miuxedavad amisa, samxreTaRmosavleTis, volgispireTis, yazaxeTis, dasavleT cimbiris, ukrainisa da Crdilo kavkasiis mSrali velebis pirobebSi sakmao did farTobebze atareben limanur rwyvas. aq rwyvis sxva gamoyeneba ar SeiZleba da limanuri rwyva rwyvis er T ad er T i s aS ual ebaa. mSral velebSi limanuri rwyvis Sedegad xelsayreli pirobebi iqmneba bunebriv saTib saZovrebis produqtiulobis gadidebisaTvis, limanuri rwyva aq Zveli droidanvea cnobili. Tovlis nadnobi wylisa da wvimis wylis Sesakaveblad buldozeriT Txrian ormoebs da Sig agroveben wyals. aseT limanebze niadagi 50-60 sm siRrmemde teniandeba, balaxnari umjobesdeba da saTib-saZovari aRidgens produqtiulobas. reliefuri pirobebis mixedviT zogjer gvxvdeba bunebrivi Cadablebuli adgilebi, romelTa datborva xdeba gazafxulze wyaldidobis dros damSral mdinareebisa da xevebis wyl i T gavs ebi sas d a s anapi r o d an gad mo svl i s Sed egad .

msubuq qviSnar niadagebze, romlebic wylis SeJonvis maRali koeficientiT da tenis Sekavebis dabali unarianobiT xasiaTdebian, limanur rwyvas ar urCeven. ar SeiZleba agr eT ve limanuri rwyva moewyos bicob (mlaSob) niadagebze mineraluri gruntis siaxlovis gamo, radgan gruntis wylis amoweva gamoiwvevs limanis ufro metad d aml aS ebas .

datborebuli wylis fenis sisqis mixedviT limani S ei Zl eba i yo s: mcire sisqis

(s i R r mi s ), R r ma s i sqi s , saS ual o s i sqi s (s i R r mi s ), limanis wylis fenis siRrme gansazRvravs sarwyavi normis sidides, cxadia, mcire sisqis limanis dros sarwyavi norma ufro mcire iqneba, vidre saSualo da Rrma l i mani s ni ad agi s d at eni anebi s aT vi s .

gamoyenebis xasiaTis mixedviT limani or tipad iyofa: mdelosa da mindvris

limanad. Uukanaskneli warmoadgens saxnav farTobs, xolo pirveli ki bunebriv saTibsaZovrebs.

limanuri rwyvis dros sarwyavi normebi damokidebulia agreTve niadagis wyl i er -

fizikur Tvisebebze. gamRvali niadagis 2,1-1,5 fenis gatenianebisaTvis saWiroa ara umetes 3-5 dRisa. bunebriv limanebze datboreba SeiZleba gaxangrZlivdes didxans, Tu balaxSi Warbobs datborebisadmi gamZle mravalwlovani marcvlovani balaxebi (ufxo Svriela, Wanga, melakuda, wivana). zogjer adre gazafxulze (martSi) zogierTi marcvlovani balaxi civi wyliT datborebas uZlebs mxolod 18 DdRes, Semdeg ki ganmeorebiT SedarebiT Tbili wyliT datborebas 14 dRemde, xangrZliv datborebas S ed ar ebi T ver itans. Mmravalwlovani parkosani balaxebi (ionja, Citifexa), 10-12 dRis ganmavl o baS i d at bo r ebi s d r o s i si ni i R upebi an.

saxnav limanebze sagazafxulo kulturebis agroteqnikis Taviseburebebis mixedviT niadagi ixvneba mzralad winamorbedis Sesabamisad sxvadasxva siRrmeze. Mmravalwliani balaxebis kords an didixis nasvens xnaven winmxvneliani guTniT 28-30 sm siRrmeze, xolo sxva erTwlovani kulturebis Semdeg ara nakleb 25 sm-isa, mzralad d amuSaveba sar evel ebi s mo spo bi s s aukeT eso s aSual ebaa.

limanebze niadagis fenebis gayinvis Tavidan asacileblad saWiroa Catardes Tovlis Sekaveba da mindorsacavi tyis zolebis gaSeneba, rac xels Seuwyobs niadagSi wylis d r o ul ad S eJ o nvas d a gaz af xul z e d aubr ko l ebl i v T esvi s wi na s amuS ao ebi s Cat ar ebas .

gazafxulze, rogorc ki xelsayreli pirobebi dadgeba, dasaTesi kult ur i s

biologiis gaTvaliswinebiT, atareben kultivacias dafarcxviT 8-10 sm siRrmeze. xolo TavTaviani marcvlovani kulturebis, sakvebi balaxebis, Saqris Warxlis da sxva. kultivacias atareben Tanmiyolebuli farcxviT 6-8 sm siRrmeze. mxedvelobaSi unda miviRoT, rom wylisagan ganTavisuflebuli niadagi xasiaTdeba niadagis damuSavebis mcire xnis simwifiT, Tu am vadas erTi dRiTac ki gadavacilebT, niadagi mkvrivdeba, veRar eqvemdebareba damuSavebis teqnologiur procesebs da veRar xerxdeba misi xarisxianad gafxviereba da TesvisaTvis momzadeba. Llimanebze Tesvis norma maRal i a. limanebze sxvadasxva kulturebis Tesvis norma mag. TavTaviani kulturebis dadgenili norma 20-30% -iT unda gadiddes. safari kulturis SemTxvevaSi ki mcirdeba, raTa ar mo xd es mr aval wl i ani bal axebi s CaxS o ba.

limanebze Tesvis Semdeg aucilebelia motkepna. maRali mosavlis misaRebad

l i manebz e auc i l ebel i a s as uqebi s gamo yeneba. Zi r i T ad i xvni s wi n d a gamo kvebi s s axi T .

**sasoflo-sameur neo kul t ur ebi s T es va-mo yvana Camo nad eni wyl ebi T r wyvi s pirobebSi.**

sasoflo-sameurneo kulturebis Camonadeni wyliT rwyva cnobilia germaniaSi,

inglisSi, s af r angeT S i , avs t r al i aS i , i nd o eT S i d a s xva qveynebS i .

Camonadeni wylebi Seicavs mcenarisaTvis saWiro sakvebi elementebis did r ao d eno bas -azots, fosfors, kaliums da am mxriv Camonadeni wylebis gauvnebloba ad ami ani s aT vi s soflis meurneobaSi. maTi gamoyenebis realuri xerxia. sas o f l o sameurneo kulturebis am wyliT morwyva mcenarisaTvis erTdroulad wyliTa da sakvebiT uz r unvel yo f a-mo r wyva-gano yi er eba.

am wesiT morwyvis safuZvelia, rom niadags aqvs Tviseba Seakavos Tavis masaSi is WuWyi, rac wyalSia, maT Soris mavne nivTierebanic da imave dros diddeba misi nayo f i er ebac .

Camonadeni wyliT morwyvis Tavisebureba imaSi mdgomareobs, rom rwyva xdeba mTeli wlis ganmavlobaSi qalaqebis axlo-guberniebSi specialurad gamoyenebul nakveTebze, romlebsac “samiwaTmoqmedo sarwyav mindvrebs” uwodeben. Camonadeni wyali, romelic modis qalaqis sakanalizacio qselidan, winaswar iwmindeba-sufTavdeba meqanikurad badeebis, qviSa Semkaveblis saSualebiT msxvili da wvrili minarevebisagan, QWiis kvercxebisaganac ki da sxva. gasufTavebis Semdeg wyali bunebrivi dawoliT an satumbo s ad gur i s saS ual ebi T d axur ul i mi l gamyvani T mi ewo d eba mo sar wyav mi nd o r s .

sayofacxovrebo Camonadeni wylis qimiuri Sedgeniloba icvleba wlis sezonebis

mixedviT. Amitom maTi sworad gamoyenebis TvalsazrisiT, saWiroa sistematurad gaukeTdes analizi, ramden Camonaden wyalSi SeiZleba Seerios mrewvelobis anarCeni wyali, romelSic sasargeblo nivTierebebTan erTad SesaZlebelia iyos mavne ni vT i er ebani c .

Camonaden wyals asufTaveben filtraciiT, mindvrebze, saleqavebSi aCereben Camonadeni wylis mudmiv fenas. Mis fskerze rCeba naleqi, wyali ki iwmindeba da grovdeba Rrma arxebSi. aRsaniSnavia, rom gawmendis procesis dros Camonadeni wyali kar gavs mc enar i s sakvebi ni vT i er ebi s mni S vnel o van r ao d eno bas .

naleqebisgan ganTavisuflebuli Camonadeni wyali, rogorc wesi, daxuruli mi l gamyvanebi T mi emar T er ba mo sar wyav nakveT ebz e.

saleqavebidan amoRebuli danaleqs iyeneben nakelTan an torfTan SereviT

ko mpo s t ebi s d as amz ad ebl ad . amJamad muSavdeba Camonadeni wylis biologiuri da qimiuri gawmendis meTodebi. S emo d go maz e d a z amT ar S i Sei Zl eba mo r wyva Cat ar d es gauwmend avi Camo nad eni wyl i T . mTeli wlis ganmavlobaSi morwyvis swori organizaciisaTvis saWiroa SeirCes Sesaferisi kul t ur ebi . sar wyav mi webz e mT avar i ad gi l i und a d aeT mo s s akveb kul t ur ebs (mravalwlovani balaxebi, simindi, sakvebi Warxali), agreTve kartofils da xexilis nargavebs. mTels savegetacio periodSi kartofils rwyaven mxolod adreul vadebSi. Camonadeni wylis ZiriTad nawils ki iyeneben Semodgomaze an zamTarSi gamano yi er ebel i rwyvis saxiT. balaxebi irwyveba vegetaciis periodSi, umTavresad zafxulis Sua periodSi.

sakvebi kulturebi SeiZleba moirwyas Camonadeni wminda wyliT, teqnikuri da marcvleuli ki gauwmendavi wyliT, xolo morwyva unda Sewydes erTi TviT adre mo s avl i s aR ebamd e.

ar SeiZleba mosarwyavad gamoviyenoT infeqciuri, tuperkuliozis saavadmyofoebis

d a s xva amgvar d awes ebul ebaT a Camo nad eni wyal i .

Camonadeni wyliT morwyvis dros SeiZleba niadagi damlaSdes. Aam SemTxvevaSi Rrma xvna unda Catardes 40-45 sm-is siRrmeze, romelic asrulebs meliorirebis rols. moxnul fenaSi mcirdeba qlorisa da natriumis raodenoba da matulobs kalciumis Semcveloba.

zamTarSi Camonadeni wyliT rwyvas atareben Rrma kvlebsa da zolebSi. Ggaz af xul z e atareben gadaxvnas an kultivacias 10-12 sm siRrmeze dafarcxviT. Ggadaxvnas atareben Camonadeni wylis danaleqis Casaxnavad niadagSi. amis Semdeg mindors farcxaven da t kepni an, T u ni ad agi ar ar i s Zal i an t eni ani .

Camonadeni wyliT sarwyav nakveTze ukeTesia saToxni kulturebi daiTesos (d ai r go s ) kvadratul-budobrivad, rac aadvilebs morwyvis Semdgomi gafxvierebis srulyofilad Catarebas da sarevelebTan brZolas. maT mosaspobad iyeneben agreTve qimiur s aS ual ebebs i s e, r o go r c Cveul ebr i v sar wyav mi webz e.

samiwaTmoqmedo sarwyav mindvrebze kulturaTa sixSire ramdenadme metia. meCxer naT es ebS i metismetad izrdeba Zirxvenebi (Warxali, stafilo) da tuberebi (kartofili), magram maTi xarisxi mdarea, ukeTes Sedegs iZleva mcenareTa lentiseburi (zolebrivi) ganlageba. am dros mwkrivebi ar irwyveba da Tavidan aris aucilebeli mcenarisa da nayo f ebi s d asvel eba Camo nad eni wyl i T (po mi d o r i d a s xva).

mi uxedavad imisa, rom Camonadeni wyali Seicavs mcenarisaTvis saWiro sakveb elementebs, sarwyav mindvrebze mizanSewonilia gamoyenebul iqnes, rogorc mineraluri, ise organuli sasuqebi. maTi Setanis dozebis dros mxedvelobaSi unda iqnes miRebuli Camonaden wyalSi sakvebi elementebis Semcveloba, Camonadeni wyliT morwyvis dros mosavlis mateba 10% naklebi iyo, vidre mdinaris wyliT morwyvis dros. baqteriuli sasuqebis gamoyenebis dros ki mosavlis mateba Camonadeni wyliT morwyvis dros 20%-i T met i a, vi d r e md i nar i s wyl i T mo r wyvi s d r o s .

kulturaTa sarwyavi norma unda gaviangariSoT ama Tu im kulturis moTxovnilebis mixedviT azotze. sarwyav wyalSi azotis Semcveloba ar unda aRematebodes masze mcenaris moTxovnilebas (100-150 kg 1 ha-ze). masTan optimaluri sarwyavi norma gamoiyeneba arasavegetacio (S emo d go ma-zamTris) da savegetacio rwyvebis saxiT. s aveget ac i o r wyvi s no r ma ar und a i yo s ni ad agi s wyal S emkr ebi s unar i ano baz e met i 1-1,5 m fenaSi.

Camonadeni wyliT rwyvis dros kulturebis umetesi nawilisaTvis rwyvis ukeTesi wesi kvlebSi rwyvaa. agroteqnikuri TvalsazrisiT gansakuTrebuli mniSvneloba aqvs mcire nakadiT viwro kvlebSi rwyvis Catarebas. rwyvis Catarebis dros ukeTesia gamoyenebul iqnes daxuruli qseli, drekadi da gadasatani milsadenebi. zogjer mo r wyvas at ar eben d awvi mebi T .

**Ad awvi mebi T i mo r wyva.**

dawvimebiTi rwyva imiT gansxvavdeba zedapiruli rwyvisagan, rom dawvimebiT rwyvas atareben ara niadagis zedapirze wylis moZraobiT, aramed specialuri manqanebiT an danadgarebiT, romlebic dakavSirebulia sarwyavi wylis wyarosTan (md i nar e, Wa, arxi) da axdenen wvimis msgavsad wylis gadaadgilebas mosarwyav farTobze. xelovnuri dawvimeba bunebrivi wvimis saxiT atenianebs niadags da morwyvis procesic meqani z i r ebul i a.

dawvimebiTi rwyva erTgvari upiratesobiT sargeblobs zedapirul rwyvasTan S ed ar ebi T :

1. dawvimebis dros saWiro ar aris wvrili sarwyavi qselis mowyoba (s ar wyavi kvl ebi , z o l ebi , gamyvani kvl ebi )
2. d awvi mebi T i r wyvi s d r o s s aWi r o ar ar i s f ar T o bz e T val yur i s d evneba;
3. mosarwyav farTobze mniSvnelovnad mcirdeba mosworeba-moSandakebis samuSaoebis Cat ar ebi s auc i l ebl o ba.
4. SesaZlebeli xdeba niadagis damuSavebisa da mindvris sxva samuSaoebis Catareba meqani z ac i i s saS ual ebi T ;
5. izrdeba rwyvaze mo muSaveebi s S r o mi s nayo f i er eba;
6. dawvimebiTi rwyvis dros xdeba mcenaris Camorecxva mtvrisagan, mavne sokoebisa d a mavnebl ebi s agan;
7. teniandeba aramarto niadagi, aramed TviT mcenarec da miwispira haeris fenac. Amis Sedegad SuadRis sicxeebis dros izrdeba haeri s fardobiTi tenianoba, mcirdeba ao r T ql eba d a haer i s t emper at ur a.
8. dawvimebiTi rwyva 300-400 m3/ha normiT amave dros warmoadgens gamagrilebel rwyvas.
9. dawvimebis dros SeiZleba Catardes mcenareTa fesvgareSe kveba da agreTve S xamqi mi kat ebi s S es xur eba (d as awvi m apar at z e mi magr ebul i s pec i al ur i agr egat i T ).
10. dawvimebiTi rwyva xels uwyobs niadagis aerobuli mikrobiologiuri procesebis ganvi T ar ebas , ker Zo d , ni t r i f i kac i i s process;
11. dadebiTad moqmedebs agreTve fiziologiur procesebze: swrafad xdeba foTlebis turgoris aRdgena, matulobs bageebis gaxsna da atmosferos azotis S T anT qma, as i mi l ac i i s i nt ens i ur o ba;
12. daproeqtebuli mosavlis miRebaze ufro naklebi wyali ixarjeba, vidre z ed api r ul i r wyvi s d r o s.

dawvimebiTi morwyvis zogierTi wesi xasiaTdeba naklovani mxariTac: qaris dros aRiniSneba rwyvis uTanabroba, qaris wamSi 2 m siswrafis dros aRiniSneba rwyvis uTanabroba, qaris wamSi 2 m siswrafis dros wvimis Sxefebi gverdebze isxmeba, ixarjeba meqanikuri energia, niadagi teniandeba mcire siRrmeze, Tumca amis acileba SeiZleba winaswar ni ad agi s samar ago r wyvi s Cat ar ebi T .

dawvimebiTi rwyvis Catarebis xarisxi damokidebulia nal eqi s intensiurobaze da ni ad agi s wyal gamt ar o baz e.

dawvimebiTi rwyvis msgavsad am bolo dros Tavi iCina rwyvis axalma, e.w. wveT o vani mo r wyvi s wes ma.

wveTovani morwyvis dros sarwyavi qselis nacvlad iyeneben mcire diametris milebs (sarwyav milsadenebs), romlebic saSualebas iZleva droebiTi sarwyavi kvlebi da zolebi Seicvalos polieTilenis milebiT, morwyvis procesebi mTlianad gavxadoT meqani z i r ebul i d a avt o mat i z i r ebul i .

**Qqveniadagidan rwyva.** qveniadagidan rwyvis dros mcenaris fesvTa sistemis gavrcelebis fena teniandeba sarwyavi wylis moZraobiT niadagis 40**-**60 sm-is siRrmidan z ed api r i s aken wyl i s mi wo d eba qvemo d an z emo T xo r c i el d eba s xvad as xva xer xi T ; ni ad agi s 40-45 sm-i s siRrmeze Cawyobili forebiani milebiT (30 sm daSorebiT); T xunel as ebr i xvrelebiT, romlebic keTdeba specialuri manqaniT 40-50 sm-is siRrmeze; niadagis 50-60 sm-i s s i R r mez e; niadagis 50-60 sm-is siRrmeze viwro TxrilebSi Calagebuli foriani SemavsebliT. 56 sm diametris sadrenaJo an forebian milebs awyoben xazobrivad 100-200 m sigrZeze, er T i meo r i sgan 1,75-2 m daSorebiT. mi l ebSi wyal s uS veben R i a s ar wyavi wyl i s ar xebi d an an ufro meti diametris mqone daxuruli milgayvanilobis ganmanawileblebiT. erT heqtar mosarwyav farTobs esaWiroeba 5000 m mili. sadrenaJo da forebiani milebi did kapi t al ur d aband ebas mo i T xo vs .

## daSrobiTi mel i o r ac i a

niadagis daWaobebas iwvevs rogorc zedapiruli wyalis didi raodenoba, ise qveni ad agi s wyal i .

zedapiruli wyliT daWaobebas xels uwyobs farTobis umniSvnelo qanobi, zedapiruli wylis neli dena, atmosferuli naleqebis didi raodenoba da mZime meqani kur i S ed geni l o bi s ni ad agi .

qveniadagis wyali daWaobebas iwvevs im SemTxvevaSi, Tu is zedapirTan axlos

mderbareobs an zedapirzedac amodis. aseTi daWaobeba xels uSlis kul t ur ul i mcenaris zrda-ganviTarebas. Tu niadagSi wyali zedapiramde amodis, maSin masSi haeri s r ul ebi T ar ar i s d a c xad i a mc enar ec ver gai z r d eba.

aseTi niadagis gaumjobeseba moiTxovs metad rTul RonisZiebas saTanado damSrobi

qs el i s saS ual ebi T .

d amS r o bi qs el i ar xT a s xvad as xva s i xS i r i T d a s xvad as xva si R r mi T mz ad d eba.

msubuqi meqanikuri Sedgenilobis niadagi qveniadagis wyals ufro advilad atarebs. aseT niadagze dasaSrobi qseli naklebi sixSiriT ewyoba, vidre mZime meqanikuri S ed geni l o bi s ni ad agebz e, r o mel i c wyal s met ad Znel ad at ar ebs .

r ac S eexeba z ed api r ul d aWao bebas , aq, pi r i qi T , s i xS i r e mi T uf r o met i a, r ac ms ubuqi meqanikuri Sed geni l o bi saa niadagi. mZime meqanikuri Sedgenilobis niadagSi zedapiruli wyali naklebi siCqariT Cadis da amitom dasaSvebia meti manZilis datoveba dasaSrob arxTa Soris. zedapiruli wylis mosaSoreblad arc Rma qselia saWiro, vinaidan man wyal i z ed api r i d an und a mi i R o s . Cveul ebr i v aq s i Rr me 0,5 met r s ar aRemat eba.

qveniadagidan wyaliT daWaobebuli farTobidan saWiroa am wylis gayvana da amitom damSrobi qselic met siRrmes saWiroebs. niadagis Tvisebis mixedviT siRrmec icvleba, yovel SemTxvevaSi erT metrze naklebi dauSvebelia. Tu damSrob arxTa Soris manZilis gazrda gvinda, maS i n mi s i s i R r me S es abami s ad und a gad i d d es .

rogorc vxedavT, daSroba iwvevs farTobis erTgvar daqucmacebas damSrobi qselis

gayvanis gamo. es daqucmaceba, c xad i a, xel s uS l i s meqani z ac i i s T avi s uf l ad gamo yenebas da farTobis did danaklissac iZleva. gansakuTrebiT es sagrZnobia qveniadagis wyliT d aWaobebul farTobebze, sadac zogjer arxTa Soris manZili 50-25 metramde ecema. as eT S emT xvevaS i mi mar T aven d axur ul i qs el i s gamo yenebas .

amrigad, qveniadagidan wyliT daWaobebul farTobebze iyeneben rogorc Cveulebriv R i a d amS r o b qs el s , i s e d axur ul qs el s .

## Nni ad agi s qi mi ur i mel i o r ac i a

mJave niadagebis qimiuri melioraciisaTvis awarmoeben mokirianebas, xolo bicobi

ni ad agebi s aT vi s mo T abaS i r ebas .

mokirianebis qveS igulisxmeba niadagSi kiris, dolomitis an kiris Semcveli sxva

qanebis Setana, romelic uzrunvelyofs mJave niadagebis ares reaqciis ganei t r al ebas d a mi s i nayo f i er ebi s gaumj o bes ebas .

mJave niadagebis xsnari da mSTanmTqmeli kompleqsi gajerebulia wyalbadisa da aluminis ionebiT. kiris Setanisas kalciumis ionebi aZevebs mSTanmTqmeli kompleqsidan am ionebs da amiT aneitralebs niadagis aqtualur, gacvliT da HHhidrolizur mJavianobas, zrdis masSi kalciumis da magniumis Semcvelobas, fuZeebiT maZRrobis xarisxs, xelsayrel pirobebs qmnis sasargeblo mikroorganizmebisaTvis, aumjobesebs niadagis struqturas, wyalgamtarobas da aeraciis process, adidebs wyaltevad o bas , amcirebs qerqis warmoqmnis SesaZleblobas, aiolebs niadagebis damuSavebas, adidebs niadagSi fosforis, kaliumis da molibdenis SesaTvisebeli formebis Semcvelobas. zemoT CamoTvlili dadebiTi Tvisebebis gamo mokirianeba xelsayrel pirobebs qmnis rogorc mJavianobisadmi mgrZnobiare kulturebisaTvis, rogoric arian xorbali, qeri, simindi, lobio, mzesumzira kitri da xaxvi, ise Zlier mgrZnobiare kulturebis Saqrisa d a sakvebi War xl i s , ko mbo s t o s d a s amyur as no r mal ur i z r d a ganvi T ar ebi saT vi s .

ki r i s o pt i mal ur i d o z a i angar i S eba hi d r o l i z ur i mJ avi ano bi s mi xed vi T . CaCO3 t /ha-z e = Hhi d r . ? 1,5 s ad ac , H hidr. aris hidrolizuri maJavianoba mg/eqvivalentobiT 100 gr niadagSi. mosakirianeblad kiris magari qanebidan gamoiyeneba kirqvebi, dolomitiani kirqvebi da

d o l o mi t i . rbili kiriani qanebidan kiriani tufebi, gaji da tkili. mrewvelobis ki r i ani nar Cenebi d an f i qal i s nac ar i , d ef ekac i ur i t al axi d a s xva.

TabaSiris Setanas bicobi niadagebis qimiuri melioraciisaTvis moTabaSireba ewodeba. bicobi niadagebi xasiaTdebian STanTqmili natr i umis maRali SemcvelobiT, cudi struqturiT, araxelsayreli wylisa da haeraciis reJimiT, tenian pirobebSi fuvdebian wylis cudi gamtari da webvadi xdebian. gvalvian pirobebSi imdenad mkvrivdebian, rom SeuZlebelia misi damuSaveba. bicobi niadagebis moTabaSir ebi T swordeba yvela es uaryofiTi Tviseba da xelsayreli pirobebi iqmneba mcenareTa da mi kr o o r gani z mebi s ganvi T ar ebi s aT vi s .

bicob niadagebze urCeven 1-3 t TabaSiris Setanas, saSualo da Rrma bicobebze 3-5 t,

ql o r i d s ul f at ur bi c o bebz e 5-8 t, sodian bicobebze 8-10 t d a met i .

## s asuqebi d a maT i gamoyeneba

sasoflo sameurneo kulturebis mosavlianobis gadidebis agroteqnikur

R o ni s Zi ebaT a ko mpl eqs S i gansakuT r ebul i mni S vnel o ba eni Weba sas uqebi s gamo yenebas sasuqebis terminis qveS igulisxmeba niadagSi organuli da araorganuli warmoebis

i s eT i ni vT i er ebi s S et ana, r o ml ebi c xel s uwyo ben mc enaris zrda-ganvi T ar ebi s pi r o bebs , r i s s af uZvel z ec i z r d eba s as o f l o - sameur neo kul t ur aT a mo savl i ano ba.

mineraluri sasuqi ewodeba iseT sasuqebs, romlebic mcenarisaTvis saWiro sakveb elementebs Seicaven mineralur SenaerTebSi. mineralur sasuqebs miekuTvneba azotiani, f o s f o r i ani , kal i umi ani , mi kr o d a ko mpl eqs ur i s as uqebi .

organuls miekuTvneba yvela is sasuqi, romelic ama Tu im raodenobiT Seicavs organul nivTierebas. organuli sasuqebia: nakeli, torfi, mwvane sasuqi, da organuli nivTierebis Semcveli soflis meurneobisa da mrewvelobis sxva anarCenebi (geranis, t ungi s z eT saxd el i , ko f ei ni s qar xnebi s anar Cenebi ).

organul-mineralurs ekuTvnis iseTi sasuqebi, romlebic Tavis SedgenilobaSi S eicaven rogorc organul, ise mineralur nivTierebas, aseTia: humatamoniumi, gumafosi, gumat i ni d a s xva.

baqteriuls miekuTvneba is sasuqebi, romlebic Seicaven miwaTmoqmedebisaTvis saWiro

mi kr o o r gani z mebs , as eT ebi a ni t r agi ni , az o t o geni , f o sf o r baqt er i ni d a s xva. sasuqebi niadagsa da mcenareze moqmedebis mixedviT iyofian: 1) pirdapirmoqmedi da

2. ar api r d api r mo qmed i .

pirdapir moqmedia is sasuqi, romelic SeaqvT niadagSi mcenarisaTvis saWiro sakvebi nivTierebis raodenobis gadidebis mizniT, aseTia: azotiani, fosfor i ani , kaliumiani, mi kr o s as uqebi d a s xva.

arapirdapirmoqmedia yvela is sasuqi, romelic SeaqvT niadagSi am ukanasknelis fizikur-qimiuri da biologiuri Tvisebebis gaumjobesebis mizniT. aseTia: kiri, T abaS i r i , go gi r d i d a baqt er i ul i s as uqebi .

sakvebi nivTierebis S emc vel o bi s mixedviT sasuqebi iyofa agreTve or jgufad:

1) c al mxr i vi anu mar t i vi d a 2) mr aval mxr i vi anu r T ul i . calmxrivi sasuqebi Seicaven mcenarisaTvis saWiro mxolod erT elements, aseTia: nat r i umi s gvar j i l a, az o t mJ avaamo ni umi , ql o r amo ni umi , s uper f o s f at i d a s xva.

mravalmxriv moqmedi sasuqi ki Seicavs ramdenime sakveb elements, aseTia: amofosi, ni t r o f o s ka,, kal i umi s gvar j i l a d a s xva.

## mineraluri sasuqebi

mineralur sasuqebs miekuTvneba azotiani, fosforiani, kaliumiani, mikro da

ko mpl eqs ur i s as uqebi .

**azotiani sasuqebi.** arCeven azotiani sasuqebis o T x f o r mas ; ni t r at ul s , amo ni akur s ,

nitratul- amo ni akur s d a ami d ur s . **amoniakuri sasuqebi.** maT mi ekuT vnebaamo ni umi s s ul f at i , amo ni umi s ql o r i d i , T xevad i

amoniaki , amo ni aki s wyal i d a ami kat i .

amoniumis sulfati (NH**4**)**2**SO**4**. Seicavs 21% azots da 24% gogirds. wyalSi kargad xsnadi TeTri an monacrisfro wvrilkristaluri fxvnilia. amoniumis sulfati kargi fizikuri Tvisebebis mqonea. axasiaTebs susti Hhigroskopiuloba, igi fiziologiurad mJ ave s as uqi a. er T i d a i mave nakveT z e mi s i S et ana z ed i z ed ar Sei Zl eba r ad gan gamJ avebas

iwvevs. amoniumis sulfati pirvel rigSi rekomendebulia rogorc ZiriTadi gano yi er ebi s s as uqi .

**amiakuri wyali Seicavs** 20,5% azots. misi transportireba da Senaxva SeiZleba 1-2 atmosferuli wnevis gamZle cisternebiT. amoniakis wyals mcire dozebiT iyeneben mec xo vel eo baS i s akvebi s az o t i T gas amd i d r ebl ad amiakati warmoadgens amoniumis gvarjilis wyalxsnars, romelic gajerebulia amoniakiT. Seicavs 30-45% azots. sawyobidan mindorSi amikati gadaaqvT specialuri avt o c i s t er nebi T .

**nitratuli sasuqebi.** nat r i umis gvarjila **(NaNO3)** Seicavs 15,5% azots. TeTri kristaluri marilia. wyalSi kargad ixsneba. sustad higroskopiulia da fiziologiurad tute azotiani sasuqia. misi sistematiuri gamoyeneba erTi da igive nakveTze ar SeiZleba radgan iwvevs misi fizikuri Tvisebebis gauaresebas. natriumis gvarjila nadagis mSTanTqav kompleqsSi ar Seikaveba da advilad irecxeba qveda f enebS i . ami t o m umj o bes i a gamo vi yeno T gamo kvebi s saxi T .

**amiduri formis azotiani sasuqebi.** Sar d o vana CO(NH**2**)**2** Seicavs 46% azots da kalciumis cianamidi CaCN2 azoti 19-20 %. TeTri feris kristaluri, an granulirebuli nivTierebaa, wyalSi kargad ixsneba, higroskopiulia. misi gamoyeneba ZiriTadad gamo kvebi s d r o s aa mi R ebul i . **kalciumis cianamidi** **CaCN2.** Seicavs 20-35% azots. Savi an muqi nacrisferi f xvni l i a. iwvevs Tvalisa da sasunTqi organoebis lorwovani garsis anTebas, Slis kans. fiziologiurad tute marilia. amis gamo misi Setana rekomendebulia mJave ni ad agebz e Tesvis wina kultivaciis dros. misi uaryofiTi Tvisebebi, rom Semcirdes masSi ureven navT i s z eT s and a mi s gan amz ad eben gr anul i r ebul s as uqs .

**fosforiani sasuqebis gamoyeneba** dadebiT gavlenas axdens yvela sasoflo-s ameur neo

kulturis mosavlianobaze. misi efeqti gansakuTrebiT didia azotian sasuqebTan erTad. f o s f o r i ani sas uqebi i yo f a wyal xsnad , naxevr ad xs nad d a Znel ad xs nad f o r mebad .

**wyalxsnadi fosforiani sasuqebi.** superfosfati fosf oriani sasuqebis ZiriTadi warmomadgenelia ganasxvaveben martiv da ormag superfosfats. martivi superfosfati S ei c avs 16-20% P**2**O**5**, mo r uxo mo nac r i sf er o fxvni l i a, aqvs d amaxas i aT ebel i s uni d a mJ ave reaqcia. niadagSi Seitaneba rogorc ZiriTad ganoyierebaSi xvnis win, ise Tesvis dros d a d amat ebi T gamo kvebaS i . **ormagi superfosfati** fosforiT mdidari koncentrirebuli fosforiani sasuqia. Seicavs 42-45% P**2**O**5.** nacrisferi fxvnilia. gamoiyeneba ZiriTad ganoyierebaSi, Tesvis d r o s d a d amat ebi T gamo kvebaS i **precipitati** Seicavs 35% P**2**O**5**, TeTri an Ria nacrisferi kargi fizikuri Tvisebebis mqone fxvnilia. ar axasiaTebs higroskopiuloba da Sebeltva. niadags atutianebs. misi Setana SeiZleba mxolod mJave niadagebze ZiriTad ganoyierebaSi. gamokvebaSi efeqts ar iZleva.

**f o s f o r i t i s fqvili** Seicavs 19-25% f o s f o r s , fxvnilia. wyal S i Znel ad xs nad i a. aqvs

t ut e r eaqc i a. gamo i yeneba mJave ni ad agebz e.

**kaliumiani sasuqebi.** kaliumi niadagSi SedarebiT meti raodenobiT moipoveba vidre

az o t i d a f o sf o r i , i s mc enar i s kvebi s auc i l ebel i el ement i a. **kaliumis qloridi KCl** Seicavs 56% K**2**O. TeTri feris kristaluri marilia wyalSi

kargad ixsneba, aqvs mJ ave r eaqc i a. Sei t aneba Zi r i T ad i xvni s wi n.

**40 % kaliumis** marili wyalSi kargad xsnadi narinjisferi an wiTeli kr i s t al ur i marilia, axas i aT ebs umni S vnel o hi gr o s ki pi ul o ba d a mJave r eaqc i a. gamo i yeneba Zi r i T ad i xvnis win.

**kaliumis sulfati**. kaliumis sulfatis SedgenilobaSi Sedis 48% K**2**O, TeTri feris wvrilkristaluri nivTierebaa, axas i aT ebs kargi fizikuri Tvisebebi, ar ibelteba. mJave r eaqc i a aqvs . gamo i yeneba yvel a kul t ur i s Zi r i T ad gano yi er ebaS i .

**nacari.** war mo ad gens sxvadasxva mcenareul nivTierebaTa dawvis produqts. nacari erTerTi Zvirfasi koncentrirebuli mineraluri sasuqia. mis SemadgenlobaSi Sedis kal i umi , f o s f o r i , ki r i d a z o gi er T i mi kr o el ement i .

**kompleqsuri s as uqebi .** kompleqsuri sasuqebi ewodeba iseT sasuqebs, romlis SedgenilobaSi Sedis mcenarisaTvis saWiro 2-3 da meti sakvebi elementi. ko mpl eqs ur i s as uqebi i yo f a r T ul , ko mbi ni r ebul anu r T ul S er eul d a S er eul s as uqebad .

**rTuli sasuqebi** Tavis mxriv or jgufad iyofa: 1. ormag rTul da 2. sammag rTul sasuqebad**.** ormagi rTuli sasuqi Seicavs or sakveb elements, mag. azotsa da fosfors, azotsa da kaliums an fosforsa da kaliums. aseTebs miekuTvneba amonizirebuli s uper f o s f at i , ami akur i s uper f o sf at i , amo f o s i , d i amo f o s i d a s xva.

sammag rTuli sasuqi ewodeba iseTebs, romlebic Seicaven azots, fosfors da

kal i ums magal i T ad ni t r o amo f o s ka d a s xva.

**Sereuli sasuqebi.** S eruli sasuqebi ewodeba iseTebs, romlebic miiReba martivi sasuqebis meqanikuri Serevis gziT. Sereuli sasuqebis momzadebisas saWiroa daculi i qnes gar kveul i pi r o bebi .

**mikrosasuqebi.** mi kr o el ementebis Semcvel sasuqebs mikrosasuqebi ewodeba. maT

mi ekuT vneba bo r i s , manganumi s , TuTiis, spi l enZi sa d a ko bal t i s S emc vel i sas uqebi .

boriani mikrosasuqebidan soflis meurneobaSi i yeneben: bormJ avas , bo r manganumi s

nar Cenebs d a s xva.

manganumiani mikrosasuqebidan farTod iyeneben: manganumis sulfats, manganumis

ql o r i d s , manganumi s gvar j i l as d a sxva.

T uT i ani mi kr o sas uqebi d an Zi r i T ad ad i yeneben T uT i i s s ul f at i d a T uT i s ql o r i d i . s pi l enZiani mikrosasuqebidan soflis meurneobaSi ZiriTadad iyeneben; spilenZis sulfats, spilenZis qlorids, spilenZis gvarjilas da sxv. mikro sasuqebs iyeneben S esas xur ebl ad d a ni ad agS i Ses at anad .

## organuli sasuqebi

organuli sasuqebis roli didia niadagis nayofierebisa da sasoflo-s ameur neo

kulturebis mosavlianobis amaRlebaSi organuli sasuqebi Seicaven TiTqmis yvela s akvebi el ement ebs a d a naxS i r o r J angs .

organuli sasuqebi marTalia Seicaven mcenarisaTvis saWiro ZiriTad sakveb

elementebs, magram maTi procentuli Semcveloba erTob mcirea. amitom organuli sasuqebis dadebiTi moqmedeba mcenareze arsebiTad mdgomareobs maTi SetaniT niadagi md i d r d eba humus i T , umj o bes d eba mi s i bi o l o gi ur i , f i z i kur i , qi mi ur i d a f i z i ko -qi mi ur i T vi sebebi, wylisa da haeraciis reJimi. diddeba STanTqmis tevadoba, fuZeebiT maZRrobis xarisxi, buferoba da sxva Tvisebebi fizikur, fizikur-qimiur da biologiuri pr o c es ebi s gaumj o bes ebaS i .

organul sasuqebs miekuTvneba nakeli, torfi, torfkompostebi nakel i s wunwuxi d a

mwvane sas uqebi .

**nakeli.** nakeli mecxoveleobis anarCenia. is Seicavs mcenarisTvis saWiro yvela elements. ixrwneba ra niadagSi, nakeli amdidrebs niadags da atmosferos naxSiroJangiT, romelic organuli nivTierebis warmoqmnis wyaroa. nakelis gavleniT izrdeba niadagis wylis Sekavebis unari, misi Tbotevadoba, umjobesdeba niadagis fizikuri Tvisebebi. msubuqi qviSnari niadagi misi gavleniT xdeba ufro bmuli, xolo mZime meqanikuri Sedgenilobis Tixnari ufro fxvieri, iolad dasamuSavebeli. gaangariSebulia, rom 40 t nakelis SetaniT niadagSi Sedis 500 kg mikroorganizmi, romlebic iwveven niadagis mikrobiologiuri procesebis gaZlierebas. yoveli tona nakeli yvela tipis niadagSi 1 centneriT zrdis sasoflo-sameurneo kulturebis mosavals (1 centner mosavalze gadayvaniT). varCevT ori tipis nakels: safenians da usafenos, anu Txevads. cxovelis eqskrementi ki Sedgeba magari da Txevadi masisagan. cxovelebis saxeobis. sakvebis Sedgenilobis mixedvi icvleba magari da T xevad i gamonayofis Sedgeniloba. miRebuli nakelis raodenoba erT sul saqonelze icvleba c xo vel ebi s s axeo bi s mi xed vi T (c xr i l i 3)

erT s ul msxvi l r qo s an saqo nel z e 1 wel S i mi R ebul i nakel i s r ao d eno ba (t ) c xr .# 3

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Bbagaze yofnis dros, xangr Zl i o ba (d R eebi ) | c xeni | mxvi l f exa cxoveli | cxvari | Rori |
| 220-240  200-220  180-200  180-z e nakl ebi | 6-7  5-6 4-5  3-4 | 8-9  7-8  6-7  4-5 | 0,8-0,8  0,7-0,8 0,6-0,7  0,4- 0,5 | 1,5-2,0  1,2-1,5  1,0-1,2  0,8-1.0 |

nakelis raodenobas angariSoben jogis cocxali wonis 25-ze gamravlebiT. dRe- RameSi 1000 kg cocxali cxoveli iZleva: msxvili rqosani saqoneli -48 kg, cxeni-54 kg nakels. axal nakelSi sakvebi elementebis saSualo Semcveloba Seadgens: azots-0,5; fosfors-0,3; kaliums 0,6%. naxevrad gadamwvari nakeli 29% naklebs iwonis, vidre nedli, gadamwvari nakeli-47,2%. neSompala-62,4%. nakeli saukeTeso Sedegs iZleva t o r f T an d a f o s f o r i t i s f qvi l T an d ako mpo s t ebi s as .

**t o r f i d a t o r f i ani kompos t ebi .** torfi aris naxevrad gaxrwnil mcenareuli naSTis nar evi , r o mel i c gr o vd eba War bi t eni ano bi s a d a J angbad i s nakl ebo bi s pi r o bebS i . arCeven maRlobis , dablobis da gardamavali Waobis torfebs. saSualo maCveneblebiT torfSi Sedis : azoti-1,8-3,0%, fosfori-0,2-0,5%, kaliumi- 0,1-0,3 %, magram ZiriTadad Znelad misawvdom formebSi. masSi praqtikulad ar aris mikroelementebi. torfis sufTa saxiT gamoyeneba efeqturi ar aris, radgan gaweuli xarjebi mis mopovebaze, gadazidvaze da Setanaze ver anazRaurdeba mosavlis matebiT. amis gamo torfs akomposteben nakelTan, wunwuxTan, fekalebTan da umateben mineralur da organul sasuqebs. nakel T an dakompostebas akeTeben niadagSi Setanamde 2-9 TviT adre. Setanis dozebi igivea, rac nakel i s . s uf T a t o r f i o r j er met i und a Sei t ano n.

**mwvane sasuqi.** (sideracia). mwvane sasuqSi nedli mcenareuli masaa, Caxnuli niadagSi misi organuli nivTierebiT da azotiT gamdidrebisaTvis. am mizniT daTesil mcenareebs sideratebi ewodeba. sideratebad gamoiyeneba ZiriTadad parkosani mcenareebi, romlebic atmosferos xarjze agroveben niadagSi 160-300 kg azots, koJrebSi baqteria rizobiumis meSveobiT. mwvane sasuqad iyeneben sagazafxulo, saSemodgomo da zamTris sideratebs. mwvane sasuqebis gamoyenebis oTx formas varCevT: mwvane sasuqis aqvitis- wamonazard formas, mwvane sasuqis Sualedi formas da mwvane sasuqis sacelavi formas.mwvane sasuqad daTesil mcenareebs xnaven niadagSi yvavilobis da mwvane parkebis gamotanis fazaSi, radgan am dros mcenare Seicavs yvelaze met, misTvis saWiro sakveb elementebs, Tanac warmoqmnili organuli nivTiereba, am fazaSi Caxnuli, niadagSi advilad ixrwneba. sideratebis Caxvna unda moxdes momdevno kulturis Tesvamde 20-30 dRiT adre. mwvane sasuqebis Caxvnis pirvel wels mcenares SeuZlia SeiTvisos Caxnuli masis 30-40% azoti. erTwlian sideratebs kargi mosavlis SemTxvevaSi SeuZlia niadagSi daagrovos 160 kg azoti. mravalwliani sideratebi ki agroveben 300 kg azots. mwvane sideratebis narCeni azoti agrZelebs moqmedebas momdevno welebSic. mwvane sasuqebis organuli nivTiereba aumjobesebs niadagis qimiur, fizikur, fizikur –qimiuri da biologiur Tvisebebs. mwvane sasuqebis Caxvnis dros Semdgomi kulturisaTvis fosforiani da kaliumiani sasuqebis Setana auc i l ebel i a. mwvane sasuqebis efeqturoba damokidebulia niadagis Tvisebebsa da Caxnul i mwvane mas i s r ao d eno baz e, Caxvni s t eqni kas a d a vad az e.

**mdinaris Slami.** saqarTvelos mTelrig mdinareebs moaqvs didi raodenobis

ativtivebul organul da mineralur nivTierebaTa nawilakebi. o r ganul i ni vT i er ebi d an wyalSi ativtivebulia sxvadasxva xarisxiT gaxrwnili mcenareuli produqtebi, xo l o mi ner al ur i nivTierebidan ZiTiTadad karbonatuli qanebi. wyalSi ativtivebuli nawilakebis raodenoba icvleba wlis periodebis mixedviT. Semodgomaze da adre gazafxulze wyals meti organuli da mineraluri nivTiereba moaqvs, vidre zafxulSi. wyalSi ativtivebuli nawilakebis raodenoba izrdeba wvimian da naleqian amindebSi. mdinaris wyalSi ativtivebuli nawilakebis, Slamis Semcveloba wlis ganmavlobaSi 0,150,3%-is farglebSi meryeobs. md i nar i s SlamSi saSualod Sedis 0,09-2,16% azoti, 0,15-0,52 % fosfori, 0,13-0,94% kaliumi da 6,5% kalcoumi. dasavleT saqarTveloSi ni ad agi s mosaSlamvad iyeneben-rionis, cxeniswylis, gubiswylis, texuras, sufsis, da s xva mdinareebis Slams. niadagis moSlamvas axdenen rogorc wylis miSvebiT nakveTebze, ise arxebSi da mdinaris napirebze dagrovili Slamis nakveTebSi SetaniT. dasavleT saqarTvelos raionebSi, rogoricaa samtredia, quTaisi, xoni, wyaltubo, abaSa, Cxo r o wyu, zugdidi, walenjixa da sxva raionebi, didi xania ic no ben mdinaris Slamis s as uqad gamoyenebas. mdinaris Slamis gamoyenebiT mkveTrad diddeba sasoflo- sameurneo kulturebis mosavali. kerZod simindis mosavali saSualod gaizarda 11,9 centneriT heqtarze. Slamis moqmedeba ar ganisazRvreba erTi wliT. misi Semdgomi moqmedeba ufro metia pirdapir moqmedebasTan SedarebiT. Slamis dozebis winaswari gansazRvra metad Znelia, radgan, erTi da igive mdinaris Slamis Sedgenilobac ki icvleba wlis sezonisa da mosuli naleqebis raodenobis mixedviT. saSualod erT heqtarze SeaqvT: 40-50: 60-100 tona Slami. moSlamva SeiZleba mTeli wlis ganmavlobaSi. igi niadagis zedapirze unda moibnes, rac SeiZleba Tanabrad, amave dros auc i l ebel i a mi s i mal e Caxvna.

**vermokompostebi.** vermokompostebi iwarmoeba niadagSi arsebuli o r ganul i anar Cenebi s Wi ayel ebi s mi er gad amuSavebi T .

gansakuT r ebi T mebo s t neo baS i , vermikompostebs gaaCniaT udidesi potenciali mcenareTa zrda-ganviTarebis gaumjobesebis saqmeSi.Mmagram rogorc Cans sxvadasxva vermikompostebsa da kompostebs Soris aris sxvaoba, romelic dakavSirebulia sxvadasxva bunebriv mikroflorasTan da sakvebi elementebis gansxvavebul S emc vel o basT an.

**s aqar T vel o Si As ar evel a mc enar eebi s gavr c el ebi s md go mar eo ba da maT wi naaRmd eg br Zo l i s bi o l o gi ur i Ro ni s Zi ebebi**

## a) sarevelebi da maT mier gamowveuli ziani: sxvadasxva avtorebis azriT “sar evel a

warmoadgens mavne, ulamazo da sakmaod usargeblo mcenares, an “sarevela es mcenarea romelic mocemuli pirobebisaTvis SeuTavsebelia”, an “mcenare romelic izrdeba iq sadac sasurvelia izrdebodes sxva romelime mcenare”, mcenare romelic araviTar ekonomikur Rirebulebas ar warmoadgens”, “mcenare romlis uaryofiTi Tvisebebi sWarbobs dadebiTs”- da bevri sxva. rogorc aRniSnaven ingliseli mecnierebi d. algreni, d. klingerni da volfi, yvel a es ganmar t eba xaz s us vams ar a i md enad sar evel a mcenareTa mavneobas, ramdenadac maT arasasurvelobas. Pprof. s.a.kotis ganmartebiT“ sarevela mcenareebi anu sarevelebi ewodebaT iseT mcenareebs romelTa kultivirebas ad ami ani ar awar mo ebs T avi s i mi z nebi saT vi s ”.

sarevela ewodeba TavisTavad mozard balaxeul mcenareebs, romlebic asarevlianeben sxvadasxva sasoflo-sameurneo kulturebs. maT didi zianis motana SeuZliaT kerZod, sarevela kulturul mcenareebs ecileba wylis, sakvebi ni vT i er ebebi s a d a mz i s s xi vur i ener gi i s SeT vi s ebaSi .

mravali sarevela Rero-foTlebiT exveva kulturul mcenares da iwvevs mis

Cawolas.

dasarevlianebuli mindvris kulturebis mosavlis aReba gaZnelebulia \_ isini

exvevi an ko mbai ni s mbr unav nawi l ebs d a xSi r ad az i aneben maT .

sarevela mcenareTa Tesli atenianebs marcvleuli kulturebis mosavals, ris gamoc

gaZnel ebul i a maT i S enaxva-d axar i s xeba.

mravali sarevela Seicavs momwamlav nivTierebebs da Tu isini moxvdnen adamianis an cxovelis sakvebSi, wamlaven maT. zogierTi sarevela rZes da rZisgan miRebul pr o d uqc i i s xar i s xs d abl a s wevs -aZl evs c ud s uns a d a gemo s .

sarevela mcenareebi xels uwyoben sxvadasxva mavneblebisa da daavadebebis gamravlebas. magaliTad, mxoxavi Wanga-xorblis Jangas, ZaRlyurZena-kartofilis kibos, nac ar qaT ama-War xl i s c xvi r gr Zel as gamr avl ebas d a s xv.

n. a. kar po vi s mo nac emebi T s ar evel ebi s gamo yo vel wl i ur ad i kar geba mT el i mo s avl i s ?1/4 dan ?1/2 nawili. sarevelebi arTmeven kulturul mcenareebs sinaTles, siTbos, tens, sakveb nivTierebebs. isini xels uwyoben mcenareTa mavneblebisa da daavadebebis gavr c el ebas , aZnel eben s o f l i s war mo ebi s meqani z ac i i s pr o c es s.

sarevela mcenareTa mier gamowveuli ziani milionobiT maneTs Seadgens, msoflios

mi waT mo qmed eba s ar evel ebi sagan yo vel wl i ur ad 65 mi l i o n t o na mar c val s kar gavs sasoflo-sameurneo kulturaTa Tesva moyvanis Tanamedrove teqnologiis pirobebSi sworad, rom ganisazRvros sarevela mcenareebTan brZolis RonisZiebaTa srulyofis gzebi, aucilebelia detalurad SeviswavloT maTi saxeobrivi Sedgeniloba, f o r mi r ebi s kano nz o mi er ebani z o nal ur i t eqno l o gi i s po r o bebS i .

sarevelebs uwodeben yvela im mcenareebs, romelbic sasoflo-s ameur neo

kulturaTa naTesebSi izrdebian da Tavisi arsebobiT uaryofiT gavlenas axdenen mo s aval z e d a pr o d uqc i i s xar i sxz e.

mindorTa dasarevlianebis xasiaTi icvleba klimaturi pirobebis, kulturis Taviseburebebis, niadagis Taviseburebis misi damuSavebis sistemis, qimiuri margvlisa da sxvaTa mixedviT. amitom aucilebelia yovel mindorSi periodulad tardebodes sarevela mcenareTa aRricxva. yoveli Semdgomi Catarebuli aRricxva gvi Cvenebs Catarebuli RonisZiebebis Sedegad momxdar cvlilebebs. am gziT miRebuli masalis anal i z i da misi agroteqnikasTan dakavSireba SesaZleblobas iZleva adgilobrivi pi r o bebi s S esabami s ad S emuSavd es s ar evel ebT an br Zo l i s uf r o met ad ef eqt i ani xer xebi . prof. g. qeSelaSvili amtkicebs, rom saqarTveloSi mcenareTa daraionebis TvalsazrisiT mkveTr pirobebTan gvaqvs saqme, radgan misi aRmosavleTi, samxreTi da dasavleTi nawilebi bunebrivi pirobebiT didad gansxvavdebian erTmaneTisagan. Tavis mxriv, dasavleT saqarTvelos mcenareuloba, saerTod da sarevela mcenareuloba, kerZod, imiT gamoirCeva, rom maT Soris ufro metad gvxvdeba zomieri havisa da gansakuT r ebi T t eni ani s ubt r o pi kebi s mc enar eul o ba.

aRmosavleT da samxreT saqarTvelos dasaxlebul mxareSi adamiani bunebaze z emoqmedebiT ufro metad iwvevs cvlilebebs, vidre kaxeTsa da dasavleT saqarTveloSi. mkveTri cvalebadoba SeimCneva gansakuTrebiT qarTlsa da garekaxeTis vakeebsa da mTis ferdobebze gavrcelebuli sarevelebis ZiriTadi Sedgeniloba mainc erTgvarovnebiT xasiaTdeba. aRsaniSnavia agreTve, rom velis balaxa mcenareulobis didi nawili SeWrilia saxnav-saTes savargulebze da sarevela mcenareebad gvevl i nebi an.

saqarTveloSi g.qeSelaSvilis monacemebiT 970 saxeobaze meti sarevela mcenarea, rac respublikis floris 23 procentia. cnobilia, rom 1930 wlamde sasoflo-sameurneo kulturebis naTesebSi daaxloebiT 300 saxeobis sarevela balaxi gvxvdeboda, erT kvadratul metrze saSualod modioda 300-500 cali sarevela da sarevelebis procenti 80-s Seadgenda. 1965 wlisaTvis sarevelaTa raodenoba respublikis masStabiT saSualod erT kvadratul metrze 30-50 calamde Semcirda. vfiqrobT es movlena gamoiwvia respublikis imdroindeli mTavrobis mier sarevelebis winaaRmdeg efeqturi RonisZiebebis sistematiuri gatarebiT. Tumca sarevelebis ZiriTadi Semcireba moxda erTwlianebis xarjze. r egi o nebis mixedviT saxnav-saT es i mi webi erTimeorisagan gansxvavdebian, rogorc dasarevlianebis xasiaTiT, ise iq gavrcelebuli saxeobaTa r ao d eno bi T . ZiriTadad qarTlisa da kaxeTis raionebisaTvis damaxasiaTebelia stepis mc enar eul o bi d an SemoWrili sarevelebi. TiTqmis yvelgan gvxvdeba ufro gavrcelebuli sarevelebis zogierTi saxeoba: Svriuka, xvarTqla, TeTri nari, Tero, feriscvala, rZiana, xovera, yanis Wleqi. Salga balaxi, Zalzed gavrcelebuli da Znelad mosaspobi sarevelebia mxoxavi Wanga, jijlaya, Svriuka, qvapura, ambrozia, abreSuma, qinZara, glerta, nacarqaTama, vardkaWaWa, birka, yviTeli ZiZo, mravalZarRva, baia, boloka, Zur webi , S al af a, bur Cxa d a s xva.

aqa iq iseTi sarevelebic gvxvdeba, romlebic damaxasiaTebelia ama Tu im adgilisaTvis (abezari sarevelebia) magaliTad, Wiota, laSqara, mwara, qinZara, veluri kanaf i , maxo bel i mi nd vr i s nar i d a s xva.

amgvar ad , aRmosavleT saqarTvelos mindvris kulturebis ZiriTadi sarevelebs Seadgens 17 saxeoba, romelTa Sexvedriloba 80-100%-i a. rogorc aRmosavleT saqarTvelos ise dasavleT saqarTveloSi sarevela mcenareTa Sedgeniloba metad mravalferovania. aq ufro metad gvxvdeba zomieri havisa da teniani subtropikebis mc enareuloba, qserofitebi ki- naklebad gavrcelebuli sarevelebis umetesoba ad gi l o br i v f l o r as mi ekuT vneba.

kolxeTis dablobis sarevela mcenareTa Sedgenilobis Seswavlam gviCvena, rom aq farTodaa gavrcelebuli maTi 200 saxeoba. mindvris kulturebs ufro metad vnebs Semdegi sarevelebi: mamula, Salafa, glerta, qasra, mxoxavi Wanga, walika, xvarTqla, mindvris nari, eweris gvimra, babuawvera, vardkaWawa, burCxa, tyis Wortana, mwyerfexa, Zurwebi, yanis Wleqi, cxenis kuda, jijlaya, wiwmatela, JunJruki, abreSuma, nacarqaTama, d and ur i , bambuki s bal axi , R o r i s bi r ka, l akar t i a, ambr o z i a d a sxva.

arsebuli monacemebis safuZvelze, am mxarisaTvis SeiZleba dasarevlianebis ramdenime tipi davasaxeloT. magaliTad, vakeebis aluviuri niadagebisaTvis damaxasiaTebelia: mamula, Roris birka, lakartia, glerta da zogierTi sxva. f er d o bebz e umet es S emT xvevaS i gavr c el ebul i a: Cveul ebr i vi nami kr ef i a, kavkas i ur i ur o , yviTeli Zurwa da sxva. samxreT daqanebaze-lakartia. Tu aWara guriaSi, sadac wiTelmiwa niadagebia gavrcelebuli, erT-erTi Cveulebrivi da amave dros abezari sarevelaa qasraa, CrdiloeT raionebSi Warbobs lakartia da Salafa. amave dros S ei mCneva abez ar i s ar evel ebi mwyer f exa, yvi T el i Zur wa, ambr o z i a d a s xva. aq CamoTvlili Znelad mosaspobi sarevelebi did zians ayeneben mravalwliani

axal gaz r d a nar gavebs , saneer geebs d a bo st an-baRCeul kul t ur ebi s naT es ebs . **Ks ar evel a mc enar eT a** **kl as i f i kac i a** c xr . # 4

|  |  |  |  |
| --- | --- | --- | --- |
| araparaziti | | paraziti |  |
| mo kl exno vanebi | mr aval wl o vanebi | parazitebi | Nnaxevrad parazitebi |
| efemerebi s agaz af xul o :  saadreo    sagviano mozamTre saSemodgomo  o r wl i anebi | fesuriani fesvnayariani bolqviani t uber i anebi mxoxavi mT avar f es ur i ani f unj a f es vi anebi | Reros fesvis | fesvis |

amrigad, dasavleT saqarTvelos mindvris kulturebis ZiriTadi sarevelebis 31 saxeobaa, romelTa Sexvedriloba 70-100%-ia. xSiria, magram yvelgan ar gvxvdeba 18 s axeo ba-S exved r i l o ba-40-70%; bo s t an baR Ceul kul t ur aT a naT es ebS i gvxvd eba 30 saxeo ba- Sexvedriloba 80-100%, xSiria, magram yvelgan ar gvxvdeba 15 saxeoba, romelTa S exved r i l o ba 40-80 %-ia.

aRsaniSnavia isic, rom saqarTvelos bunebrivi saTib-saZovrebi cudi

eqsploataciisa da mouvlelobis gamo Zalze dasarevlianebulia. umet es ad gavrcelebulia sxvadasxva abezari sarevela: Zigva, anu qisriba, marmuWi, urci, Sxama. as evea s agaz af xul o s aZo vr ebz ec . sad ac gvxvd eba s xvad asxva nar i , bai a, R i R i l o , d a s xva. maTSoris mindvris gvirilac, romlis gavrcelebis ZiriTadi keraa dmanisis raioni. gvxvd eba agr eT ve bar S i c , ker Zo d muxr ani s vakeebz e d a s xvaganac .

gansakuT r ebul i nt er es s i wvevs s aqar T vel o S i gavr c el ebul i sakar ant i no s ar evel a

mcenareebi: avSanfoTliani ambrozia, samnakvTiani ambrozia, karolinis ZaRlyurZena, mwar a, abr eS uma d a s xva.

**s ar evel a mc enar eebi d a maT wi naaRmd eg br Zo l i s saSual ebebi**

sasoflo sameurneo kulturaTa naTesebis da nargavebis dasarevlianebasTan s abr Zo l vel ad mimarTaven garkveul RonisZiebaTa kompleqs. am RonisZiebaTa kompleqsis Catareba sawindaria sarevela mcenareTa raodenobis Semcirebisa da mo savl i ano bi s gadidebis. dasarevlianebis winaaRmdeg Casatarebeli RonisZiebaTa kompleqsi iyofa Semdeg jgufebad: gamafrTxilebeli da mospobiTi. gamafrTxilebeli RonisZiebis Catareba saSualebas iZleva Tavidan iqnas acilebuli naTesebis Tu nargavebis dasarevlianeba. amasTan ixSoba is gzebi, saidanac SeiZleba gavrceldes savargulebze s ar evel a.

sarevela mcenareTa winaaRmdeg brZolis RonisZiebaTa sistemis SemuSavebisaTvis safuZvlad aiReba sarevela mcenareTa biologiuri Taviseburebebi, maTi saxeobrivi S ed geni l o ba, d asar evl i anebi s xar i s xi d a xas i aT i .

sarevela mcenareTa raodenoba, saxeobrivi Sedgeniloba sistematiurad icvleba sxvadasxva faqtoris, klimatis, niadagis, sarwyavi wylis, qaris, brZolis RonisZiebaTa sistemis, niadagis damuSavebis, cxovelis, frinvelis, gamoyenebuli saTesle masalis da s xvaT a gavl eni T . ami t o m sar evel a mc enar eT a winaaRmdeg brZola warmatebuli, rom iyos, yovelwliurad unda mimdinareobdes sarevela mcenareTa aRricxva da mis safuZvelze d asar evl i anebi s r uki s S ed gena d a br Zo l a.

yovelive es saSualebas mogvcems agreTve ganvsazRvroT ganxorcielebul brZolis RonisZiebaTa Sedegi da SevitanoT garkveuli koreqtireba arsebul brZolis

R o ni s Zi ebaT a s i s t emaS i . sarevela mcenareTa winaaRmdeg brZolis RonisZiebebi iyofa or jgufad:

gamaf r T xi l ebel i d a mo spo bi T br Zo l i s R o ni s Zi ebebad .

## gamaf r T xi l ebel i R o ni s Zi ebebi

1. s a T e s i m a s a l i s g a w m e n d a sarevelebisagan. sarevelebisgan gawmendili da kargad daxarisxebuli Tesli daTesil unda iqnes racionaluri normiT, optimalur vadebSi, Tesvis progresuli wesiT, amiT mivaRwevT imas, rom saTes farTobze kulturis TeslTan erTad veRar Seva sarevela mcenareTa Tesli; kultura mTlianad aavsebs saTes farTobs da Tavisufali adgili aRar darCeba s ar evel ebi s aT vi s ; optimalur vadaSi daTesili kultura kargad ganviTardeba TviT CaaxS o bs sar evel a mc enar eebs.

g z i s p i r e b i s , R o b i s Z i r e b i s a da sxva msgavsi adgilebis

wesrigSi moyvana-gawmenda sarevelebisagan. gzispirebis, RobisZirebisa da sxva msgavsi adgilebi sistematurad unda iTibebodes, raTa sarevelebs ganviTarebis saSualeba ar mieces.

n a k e l i s s w o r i Senaxva. zogierTi sarevela mcenareTa Tesl saqonlis kuWnawlavSi gavlis Semdeg inarCunebs aRmocenebis unars. nakelis gadawvis procesSi ki SesaZlebelia yvela sarevela mcenaris Teslmma dakargos aRmocenebis unari, radgan nakelis biologiuri wvis procesSi gamoiyofa temperatura, romelic spobs sarevela mcenareTa Teslebs. nakeli unda inaxebodes specialur sanakele ormoebSi (gar kveul i d r o i s ganmavl o baSi) mis s r ul gad awvamd e.

k a r a n t i n i orgvaria: Siga da gare. Siga karantini gzas uxSobs raionidan raionSi, regionidan regionSi, respublikidan respublikaSi sarevelebis gadatanas da maT gamravlebas; sagareo karantinis amocanaa, ar dauSvas sazRvargareTidan saTesle masalis, nergebisa da sxva masalebis Semotanis dros sarevela mcenareTa Semoyoleba. sakarantino RonisZiebebia: sakarantino sarevelebiT dasarevlianebuli saTesle masalis dasaTesad gamoyenebisa da gatanis akrZalva, saTesle masalis partia, romlis gawmend a-gasufTaveba ar xerxdeba sakarantino sarevelebisagan, unda moispos (d ai f qvas an daiwvas); sakarantino sarevelebiT dasarevlianebuli kerebi saswrafod unda ganadgurdes; manqana-i ar aR ebi , tara, romlebic gamoyenebuli iyo sakarantino sarevelebiT dasarevlianebuli saTesle masalis gawmendis an gadazidvisaTvis, guldasmiT unda gaiwmindos; narCenebi, romlebic gamoiyo sakarantino sarevelebiT d asar evl i anebul i saT es l e mas al i s gawmend i s d r o s und a d ai wvas .

sakarantino sarevelebad miCneuli a: ambrozia, mwara, Salafa, abreSumas yvela saxeoba, tyis Wortana, lakartia, ekliani ZaRlyurZena, mrgvali Tavnaskva, sqelnayofa s o f o r a, mr gval i c i per us i , mawaqi , j i j l ayi s ebr i aks i r i s i .

gamafrTxilebeli zomebi winaaRmdegobas uweven sarevelebis Semotanasa da gamravlebas mindvrebze. aseT RonisZiebebs miekuTvnebian: TeslbrunvaSi kulturaTa swori morigeoba. saTesle masalis guldasmiT gawmenda. Tesvis optimaliri normebis, vadebisa da wesebis dacva. daraionebuli jiSebis gamoyeneba. sarevelebis Tavis droze ganadgureba. mosavlis Tavis droze da maRalxarisxovnad aRema. cxovelTa kveba dafquli mcenareTa anarCenebiT. niadagis ganoyierebis mizniT mxolod gad amwvar i nakel i s gamo yeneba. s ar evel ebi s sawi naaRmd ego kar ant i ni s d ac va.

sarevelebis mospobiTi RonisZiebebi mimarTulia uSualod sarevelebis, maTi Teslebis da vegetatiuri nawilebis meqanikuri, biologiuri da qimiuri saSualebebiT mo s po bi s aken.

agroteqnikur-meqanikuri wesiT sarevelebi ispoba niadagdamamuSavebeli manqanebisa

da iaraRebis samuSao organoebiT. gaRivebis unaris mqone sarevelaTa T es l ebi saT vi s metad gavrcelebulia provokaciuli wesi, kulturul mcenareTagan Tavisufal periodSi sarevela balaxebis gaRivebisaTvis maqsimalurad xelSemwyobi pirobebis S eqmna. gaR i vebul i d a aRmo c enebul i s ar evel ebi s xvad as xva i ar aR i T i spo ba.

biologiuri wesiT sarevelebis mospoba gansakuTrebiT mniSvnelobas iZens garemos

pesticidebiT dabinZurebis problemasTan dakavSirebiT. kulturul mcenareTa T vi sebebi s a d a sar evel ebi s saxeo br i vi S ed geni l o bi s mi xed vi T i yeneben r amd eni me xer xs . mwerebis da nematodebis gamoyeneba. mwaras dasaTrgunad iyeneben mwaras nematodas RiWasi-foTo l Wamiis mweris matlebs, jvarosanTa-rafsis mxerxavas, xvarTqlebiscxvirgrZelebs. mzesumziras naTesebSi buzi kelaptaras mcenareze sdebs kvercxs da 70%-mde amcirebs mis saTesle produqtiulobas. avSanfoTliani ambroziis winaaRmd eg – ambr o z i i s xvat ar s .

fitopaTogenuri mikroorganizmebi azianeben sarevelebis vegetatiur da generatiul organoebs. soko pucinisa da Jangas sporebi mkveTrad amcireben fotosinTezur funqcionirebas da iwveven TviT mindvris naris daRupvas. alternariozis sokos sporebi xdebian ra abreSumas Reroebze, swrafad Rivdebian, mravldebian da ori kviris ganmavlobaSi klaven mcenare parazits. mwaras winaaRmdeg i yeneben mwar as Jangas .

## mospobiTi RonisZiebebi

**s ar evel a mvenar eebi s wi naaRmd eg br Zo l i s qi mi ur i Ro ni s Zi ebebi :**

saToxni kulturebis dacva sarevelebisagan agroteqnikur- meqanikuri wesiT. am wesiT sarevelebi ispoba niadag damamuSavebeli manqanebisa da iaraRebis samuSao organoebiT. dasarevlianebul nakveTze kulturul mcenareTagan Tavisufal perio d S i xd eba sar evel aT a pr o vo kac i ul i aRmo c eneba d a S emd eg maT i Caxvna ni ad agS i .

sarevela mcenareTa mospobis es wesi gamoiyeneba niadagis Tesvis wina da Tesvis S emd go mi d amuSavebi s d r o s .

fesurebis gamofitvis meTodi. fesurebis gamofitvis meTodis dros xdeba niadagis zedapirze gamoCenili fesvnayariani sarevelebis rozetebis mravaljeradi moWra (mindvris nari, Roris qada, RiWa, mwara, xvarTqla da sxva.) amasTan, Cqardeba kvi r t ebi s gaRvi Zeba d a axal i wamo naz ar d i s war mo qmna.

erTdroulad swrafad ixarjeba sakvebi elementebis maragi, rac sarevelebis gamofitvas da daRupvas iwvevs fesurebis amoxuTvas iyeneben mxoxavi Wangis. glertas, Svitasa da sxvaTa gamravlebis vegetatiuri organoebis mosaspobad, Rrmad-kvl i s fskerze Caxvnis gziT. am SemTxvevaSi niadags jvaredinad amuSaveben diskosebri i ar aR ebi T f es vebi s Zi r i T ad i mas i s ganl agebi s s i R r mez e (10-12 s m). vegetatiuri masis daqucmacebis Sedegad swrafad iRviZeben “miZinebuli” kvirtebi. wamo naz ar d i s gakeTebisTanave unda moxdes maTi Caxvna winmxvneliani guTniT. kvlis fskerze Cayrili fesurebis nawilakebi gaRviZebuli kvirtebiT umravles SemTxvevaSi ar iZlevian aRmonacens, radgan daxarjes kvebis element ebi s mni S vnel o vani r ao d eno ba, rac ufro wvrilad aris daqucmacebuli sarevelebis vegetatiuri masa da rac ufro s r ul ad ar i s i s i ni ni ad agS i Caxnul i mi T met i sar evel a d ai Rupeba.

1. **fesurebis gaxmoba.** gvalvian periodSi xvnisas fesuras aSroben mzeze, d amuSavebi s spec i al ur i xer xebi T . i s i ni amo aqvT ni ad agi s z ed api r T an axl o s , sad ac 15-20 d R i s S emd eg f esur a xmeba d a i s po ba. mo spo bi T i R o ni s Zi ebebi d an mni S vnel o vani a ni ad agi s damuSavebis swori sistemis ganxorcieleba. nawverlis gonivruli damuSaveba, kulturuli xvna, mzralad xvnis, Tesviswina damuSavebis droulad Sesruleba, Teslbr unvebi s Semo R eba d a s xva.

gansakuTrebiT unda aRiniSnos Teslbrunvis mniSvneloba sarevelaTa winaaRmdeg

br Zo l i s saqmeS i , r ad gan kul t ur aT a s wo r i mo r i geo bi s d r o s i s po ba mr aval i sar evel a. 2. s ar evel a mc enar eT a wi naaR md eg br Zo l i s qi mi ur meT o d s mni S vnel o vani ad gi l i uWiravs mospobiT QRonisZiebebs Soris. sarevela mcenareTa mosaspobad gamoyenebul

qi mi ur ni vT i er ebebs her bi c i d ebi ewo d eba. herbicidi warmodgeba laTinuri sityvebidan. herba-balaxi, caedre-mokvla, e.i. bal axi s mo kvl a.

herbicidebi iyofa or ZiriTad jgufad: 1) mTliani moqmedebis-spoben yvela saxis mcenares da 2) SerCeviTi moqmedebis- momakvdineblad moqmedeben mcenaris erT romelime j guf z e, magal i T ad o r l ebl i anebz e an, pi r i qi T er T l ebl i anebz e. her bi c i d ebi s mo qmed eba damokidebulia xmarebul dozaze, romelic unda dadgindes da dazustdes yoveli c al keul i S emT xvevi saT vi s .

herbicidebis toqsikuri moqmedebis siZliere damokidebulia mcenareSi mis SeRwevadobaze. masze mniSvnelovan gavlenas axdens mcenaris anatomiur-f i z i o l o gi ur i Taviseburebani: foTlis sidide, xaoianoba, mdebareoba, bageebis gaadgileba da sidide, sanTlisebri fifqis arseboba, razedac damokidebulia herbicidebis xsnariT mcenaris d as vel eba, f er ment ebi s S ed geni l o ba, aqt i ur o ba d a s xva.

mcenareze moqmedebis xasiaTis mixedviT SerCeviTi da mTliani moqmedebis herbicidebi iyofa or jgufad: sistemur an mcenareSi gadanacvlebad da kontaqturi herbicidebad.

sistemuri moqmedebis herbicidebi mgrZnobiare mcenaris foTolebze fesvebze moxvedrisas SeiWrebian qsovilis SigniT da maTi gadanacvleba mcenaris organizmSi xdeba WurWelgamtari sistemis meSveobiT. sistemuri moqmedebis herbicidebi Tavis mxriv iyofa or jgufad: niadagSi Sesatani herbicidebi, romelTa mcenareSi SeRweva xdeba fesvTa sistemis meSveobiT da miwiszeda nawilebze Sesatani herbicidebi, romlebic mc enar i s o r gani z mS i xvd eba Zi r i T ad ad f o T l ebi s meS veo bi T . pirveli jgufis herbicidebis Setana xdeba niadagSi Tesvamde, Tesviswina

d amuSavebi s as an T es vi s S emd eg, aRmo c enebamd e 2-3 dRiT adre.

kontaqturi moqmedebis herbicidebiT ziandeba foTlis an Reros is nawilebi,

r o ml ebs ac uS ual o d S eexeba her bi c i d i s xs nar i .

naTesebis herbicidebiT damuSaveba SeiZleba mTliani (mTeli mindvrisaTvis),

mwkr i vul i (saToxni kulturebis farTomwkriviani naTesebisaTvis). lentiseburi (saToxni kulturebis mwkrivTSorisebSi). naTesebSi herbicidis Sesxureba unda moxdes T anabr ad ganmeo r ebi T i d amuSavebi s gar eS e.

## ni ad agi s d amuSavebi s s i s t ema ni ad agi s d amuSavebi s xer xebi d a amo c anebi

niadagis damuSaveba aris adamianis kulturul meqanikuri zemoqmedeba niadagze

misi nayofierebis gadidebis mizniT. niadagis damuSavebis dros sxvadasxva sasoflos ameur neo i ar aR ebi T xd eba z ed af eni s gaf xvi er eba.

wlis ganmavlobaSi saxnav fenaSi garkveuli cvlilebebi xdeba, romelic sasicocxlo faqtorebze uaryofiTad moqmedebs. niadagis zeda Sre irRveva niadagis mravaljeradi meqanikuri damuSavebiT, naleqebisa da sxva mizezebiT, am SemTxvevaSi struqturuli agregatebi iSleba sxvadasxva nawilakebad, romlebic TandaTanobiT kargavs gafxvierebis unars. niadagis swori damuSavebisTvis (niadagis nayofierebis aRsadgenad) aucilebelia niadagis saxnavi fenis yovelwliuri amobrunebiTi d amuSaveba.

150-200 wlis winaT, rig SemTxvevaSi Sesabamisi teqnikis uqonlobis gamo miwa ixvneboda 10-15 sm siRrmeze. SemdegSi misi siRrme rkinis guTnis SemoRebasTan erTad T i T qmi s gao r magd a.

imisda mixedviT damuSavebuli niadagi muSavdeba Tu daumuSavebeli, romeli iaraRiT, ra siRrmiTa da mi z niT, arCeven niadagis ZiriTad (Rrma) da zerele (zedapiruli) damuSavebas. niadagis damuSavebis amocanaa: gafxvierdes niadagi, gaumjobesdes saxnavi fenis iseTi Seneba (struqtura), rom kargad mowesrigdes wylis,

HHhaerisa da kvebis reJimi, moispos sarevelebi, xeli Seewyos organuli nivTierebebisa da kordis daSlas, sasuqebis niadagSi kargad CakeTebas, tenis dagrovebas, Seiqmnas mcenaris fesvTa sistemis ganviTarebisaTvis normaluri pirobebi, gaumj o bes d es niadagis sasargeblo mikroorganizmebis cxovelmyofeloba, moswordes niadagis z ed api r i d a mo mz ad d es T es vi s aT vi s ni ad agi s d amuS aveba pi r o bi T ad s am j guf ad i yo f a:

1. Zi r i T ad i d amuSaveba
2. T esvi s wi na d amuSaveba
3. naT es i s mo vl i s s i s t ema.

**ZiriTadi damuSaveba** ewodeba winamorbedi kulturis mosavlis aRebis Semdeg niadagis srul siRrmeze xvnas, romelic tardeba guTnebiT, Rrma gamafxvierebliT. am d r os xdeba niadagis gadabruneba. qveda fenis zeviT amobruneba, xolo zeda gamt ver ebuli ustruqturo fenis qveviT moqceva. xvnis dros niadagSi CakeTeba xdeba guT ni s mi er mo Wr i l i sar evel ebi s d a mc enar eT a anar Cenebi s .

niadagis mosaxnavad iyeneben sxvadasxva tipis guTans. amJamad farTod gavrcelebulia e.w. kulturuli guTnebi. maT kulturuli frTis garda aqvT winmxvnelic. kulturuli xvnis dros winmxvneli Wris zeda 10 sm sisqis fenas agdebs kvlis fskerze, xolo ZiriTadi korpusis mier moWrili qveda fena gadaeyreba zemodan. aseTi operacia xels uwyobs zeda ustruqturo fenisa da sarevelaTa Teslebis s i R r meS i mo qc evas .

## xvnis simwife

xvni s Cat ar eba yo vel T vi s ar S ei Zl eba, ni ad agi i xvneba maS i n r o c a i s “s i mwi f eS i a”.

xvniswina simwifis dros niadagSi teni 50-60% unda iyos. xvniswina simwife isazRvreba, rogorc laboratoriuli meTodiT ise primitiuladac. laboratoriuli meTodis SemTxvevaSi xdeba niadagis gamoSroba, amiT zustad dgindeba niadagSi tenis raodenoba. primitiuli meTodis dros xdeba niadagis bariT amobarva niadags aviRebT xeliT, movsresT da miwaze maRlidan davanarcxebT. Tu niadagi advilad daiSala, maSin is xvniswina simwifeSia da SeiZleba xvna CavataroT, Tu aizil a War bt eni ani a, an Tu ar daiSala maSin gamogvalulia da misi arc erT SemTxvevaSi moxvna ar SeiZleba. es meT o d i z us t i ar ar i s . mi s i s i z us t e meur nez ea d amo ki d ebul i .

## xvni s s i R r me

xvnis siRrme damokidebulia niadagis tipze, saxnavi fenis siRrmeze da dasaTes kulturaze. moxvnis siRrmes didi mniSvneloba aqvs misi wyalgamtarobisa da tentevadobis unaris gasaumjobeseblad. amasTan xvna aumjobesebs haergamtarobas. moxvnis Sedegad umjobesdeba niadagSi mikrobiologiuri procesebi, Zlierdeba organuli nivT i er ebi s d aS l a .umj o bes d eba mc enar eT a kvebi s r eJ i mi .

niadagis normalur moxvnis siRrmed iTvleba 20-22 sm. 30-35 sm siRrmeze moxvna iTvleba yvelaze karg siRrmed, aseT siRrmeze moxvnisas neSompaliani horizonti mo eqc eva 30-35 s m si R r mez e. xo l o amaz e Rr mad mo xnul s pl ant aJ i qvi a.

s xvad as xva ni ad agi s aT vi s s xvad as xva kl i mat ur pi r o bebS i , R r ma kul t ur ul i s axnavi

fenis Seqmnis meTodebi sxvadasxvaa. erTbaSad ar SeiZleba gatardes niadagis gaRrmaveba da aTviseba. pirvel rigSi unda moxdes niadagis gaRrmaveba. gamaR r mavebel i mimagrebulia guTanze Rrmad frTis qveS. gamaRrmavebeli warmoadgens solisebr TaTs da belts amoubruneblad afxvierebs saxnavi Sris qveda Rrma Sres. momdevno wlebSi amgvarad gafxvierebuli niadagi guTnis TandaTanobiT 2-3 sm-s daRrmavebis gziT nawilnawilad aireva Cveulebriv saxnav SreSi. garda amisa aseT damuSavebul niadagebze SeiZleba daiTesos balaxi, sadac Setanil unda iqnes organuli sasuqi, mxolod am gz i T T u Sei Zl eba as eT i wes i T d amuSavebul i mi webi s gani ad ageba. **xvnis wesi**.xvni s r amd eni me wes i ar s eboms: 1 kvalsaqcevebad xvna, 2. f i gur ul i xvna d a

3. martivi (c al mxr i vi ).

**kvalsaqcevebad** **xvnis** dros mosaxnavi farTobi iyofa saqcevebad. saqcevis sigrZe nakveTis sigrZis toli unda iyos, sigane guTnis modebis ganis mixedviT unda ganisazRvros. saqcevis TavSi da boloSi toveben agregatis mosabrunebel zols, romelic ixvneba saqcevebis xvnis damTavrebis Semdeg. xvnis perpendikularuli mimarTulebiT. kvalsaqcevi ixvneba naRarad da nazurgad. nazurgad ixvneba pirveli da mesame kvalsaqcevi, naRarad ki meore da meoTxe. momdevno wels ar SeiZleba naRari moixvnas naRarad, nazurgi ki nazurgad. winaaRmdeg SemT xvevaS i nakveTis zedapiri t al R i sebr f o r mas R ebul o bs d a mas z e t eqni ki T muSao ba gaZnel d eba.

**f i gur ul i xvna**. ar as wo r i ko nf i gur ac i i s mqo ne nakveT z e awar mo eben f i gur ul xvnas .

figuruli xvnis dros guTani sistematiurad CarTulia. aseTi wesiT moxvnis dros rCeba gadaubrunebeli beltebi, razedac rCeba sarevelebi. amJamad saqarTveloSi f i gur ul xvnas ar mi mar T aven.

**martivi (calmxrivi) xvnis** dros belti brundeba erTi mimarTulebiT- mar j vni v,

xo l o meo r e mi mar T ul ebi s d r o s mar c xni v. aseT i wes i T , mxo l o d f er d o bebs xnaven.

**ni ad agis ufrTo guTniT damuSaveba.** am SemTxvevaSi xdeba niadagis damuSaveba beltis gadabrunebis gareSe. es operacia tardeba t.malcevis mier Seqmnili ufrTo guTniT.

ufrTo guTniT moxvnis SemTxvevaSi niadagis zedapirze rCeba, rogorc mcenareTa anarCenebi, ise sarevela mcenareTa Teslebi, mavnebelebi da daavadebebis gamomwvevi organizmebi. am SemTxvevaSi xdeba niadagis zeda nawilSi organuli nivTierebis dagroveba mcenareTa anarCenebis lpobis Sedegad. ar xdeba niadagis zeda da qveda fenis erTmaneTTan Sereva. ufrTo guTniT niadags xnaven gvalvian adgilebSi. aseTi wesiT niadagis damuSaveba xels uwyobs SromiTi danaxarjebisa da produqc i i s T vi T R i r ebul ebi s Semc i r ebas .

**niadagis brtylad mWrelebiT damuSaveba.** ni ad agi s mr t yl ad mWr el ebi T d amuS avebi sas

iyeneben specialur brtyladmWrel Rrmad gamafxvierebel iaraRebs. es iaraRebi niadagis zedapirze tovebes mcenareTa anarCenebis 70-81% da afxviereben niadags 30 sm siRrmeze. zedapirze darCenili mcenareTa anarCenebi xels uwyoben qaris siCqaris Senelebas. Tovlis dagrovebas da rac mTavaria amcirebs eroziul procesebs. niadagis aseTi wesiT damuSavebas mimarTaven qarismieri eroziis adgilebSi. brtylad mWr el ebi T damuSavebisas xelsayreli pirobebi eqmneba sarevela mcenareebis gamravlebas, amitom auc i l ebel i a am wes i T d amuS avebi sas s ar evel ebi s wi naaR md eg her bi c i d ebi s gamo yeneba.

## xvna d a mas z e wayenebul i ZiriTadi agroteqnikuri moTxovnebi

kulturul mcenareTa maRali mosavlis misaRebad niadagis damuSaveba unda tardebodes maRal agroteqnikur fonze. am samuSaoTa Sesrulebisas agroteqnikur mo T xo vnaT a darRveva mcenareTa zrda ganviTarebis pirobebis gauaresebas iwvevs, riTac mc i r d eba sas o f l o s ameur neo kul t ur aT a mo s avl i ano ba.

xvnis ZiriTadi agroteqnikuri moTxovnebia: 1. beltis sruli gadabruneba da daSla; mcenareuli narCenebis, kordis, sarevelebis, sasuqebis srulad CakeTebis da saerTod winamorbedi kulturebis narCenebis CakeTebis xarisxi. niadagis moxvna wvimis dros dauSvebelia. gaTvaliswinebuli unda iqnes dasaTesi kulturis Tavisebureba, amindis pi r o bebi .

1. xvna unda tardebodes agroteqnikurad Sesaferis vadasa da siRrmeze, Cveulebriv ara nakleb 22 sm siRrmisa, Txeli niadagebis SemTxvevaSi misi nayo f i er ebi s s i R r mez e.
2. xvna unda tardebodes uxarvezod, guTnis yvela korpusi Tanabari sigrZisa da siganis swor kvals unda avlebdes. xvnis damTavrebisTanave kvlis Tavi da bolo unda mo i xnas .
3. xnulis siRrme da Txemianoba Tanabari unda iyos. xvnis siRrmis gadaxra mxo l o d d asaSvebi a 1 s m –s f ar gl ebS i .

**niadagis damuSavebis specialuri wesebi.** niadagis damuSavebis specialur wesebs miekuTvneba: plantaJi, fenobrivi moxvna, frezva da sxva. plantaJs mimarTaven nargaobisaTvis niadagis pirveladi damuSavebis dros, magaliTad, vazis, xexilis, citrusebis, Txilis, kivis da sxva mravalwliani kulturebis plantaciis gasaSeneblad. plantaJis wesiT niadagis moxvna SeiZleba 40-100 sm siRrmeze. plantaJi saWiroa raTa Seiqmnas Rrmad gafxvierebuli niadagis fena, raTa niadagis damuSavebis am wesma xeli Seuwyos mravalwlian kulturebis fesvTa sistemas Rrmad, laRad ganviTarebas, wyl i T a d a sakvebi T uz r unvel yo f as .

plantaJis wesiT SeiZleba damuSavdes mindvris kulturebisaTvis niadagebi im SemTxvevaSi rodesac niadagi sarevela mcenareebiT Zlier iqneba dasarevlianebuli., xolo danarCen SemTxvevaSi mindvris kulturebisaTvis aseTi wesiT niadagis damuSaveba eko no mi ur ad gamar T l ebul i ar ar i s .

**ni ad agi s f enobr i vi** **wesiT damuSaveba.** niadagis humusovani fenis simciris, an qveda horizontSi mavne Carecxili nivTierebebis Semcvelobis SemTxvevaSi saplantaJo xvna SeuZlebelia, am SemTxvevaSi mimarTaven niadagis fenobriv damuSavebas. amasTan niadagis wylis Jonvadobis gasaZliereblad da eroziuli procesebis Sesamcireblad mimarTaven f eno br i v d amuSavebas mc i r e d aqanebi s f er d o bebz ec .

**frezva.** frezebiT niadagis gafxvierebas frezvas uwodeben. am SemTxvevaSi

SesaZlebelia niadagi gafxvierdes 20-25 sm siRrmeze. Tu frezireba normalurad Catarda maSin ar aris saWiro niadagis Tesviswina damuSaveba sxva xerxebiT. frezas farT o d i yeneben ko l xeT i s d abl o bz e mZi me meqani kur i S ed geni l o bi s ni ad agebz e

**ni ad agi s z ed api r ul i d amuSavebi s wesebi d a i ar aRebi**

niadagis zedapiruli damuSaveba miznad isaxavs niadagis qerqis mospobas, xnulis

gafxvierebas, gatkepnili fenis gafxvierebas, sarevelebis moWras, Teslis CaTesvis siRrmemde niadagis gafxvierebas. niadagis zedapiruli gafxvierebis siRrme Seadgens 10-

12 sm-s.

ni ad agis zedapirul damuSavebaSi Sedis: aoSva, kultivacia farcxva, moSleifeba,

mo t kepna, nawver l i s aCeCva.

a C e C v a moxvnis win, mosavlis aRebisTanave tardeba. aCeCva tardeba diskoebiani i ar aR ebiT. aCeCvis Sedegad xelsayreli pirobebi eqmneba sarevela mcenareTa Teslebs aRmocenebisaTvis. aCeCvis Semdeg aRmocenebuli sarevelebis mospoba SeiZleba niadagSi Caxvni T , an S es abami s i her bi c i d ebi s gamo yenebi T .

a o S v i s dros aCeCvisgan gansxvavebiT xdeba xnulis gafxviereba, aneulis drogamoSvebiT gafxviereba, xnulSi gaCenili gamkvrivebuli masis gafxviereba, s ar evel ebis moWra. aoSvis dros, roca sarevelebi mcire raodenobiTaa gamkvrivebuli goroxovani zedapiris gasafxviereblad gamoiyeneba diskoebiani farcxi. taniani saoSebi gamoiyeneba im SemTxvevaSi, roca xnulis zedapiri daSlilia da sarevelebi mo mr avl ebul i a.

k u l t i v a c i a tardeba gafxvierebuli fenis gadmoubruneblad. misi mizania niadagis gafxviereba, sarevelebis moWra. kultivacia tardeba xnulSi da naTesebis mwkr i vT S o r i s ebS i . xnul i s S emT xvevaS i kul t i vac i i s mi z ani a 5-15 sm s i R r mez e gaf xvi er eba beltis gadaubruneblad, xolo mwkrivTSorisebSi kultivaciis mizania niadagis gaf xvi er eba d a sar evel ebi s mo Wr a, mi ner al ur i s as uqebi s CakeT eba.

f a r c x v i s SemTxvevaSi beltis gadaubruneblad xdeba niadagisa da naTesebis gafxviereba, am SemTxvevaSi niadagis gafxvierebasTan erTad iWreba sarevelebi da wyd eba qved a d a z ed a f enas S o r i s kapi l ar ul i kavS i r i , r ac amc i r ebs ao r T ql ebas . d a S l e i f e b i s (mosworebis) dros xdeba xnulis zedapiris mosworeba. daSleifebas axdenen adre gazafxulze dafarcxvamde. daSleifebiT xdeba tenis ao r T ql ebi s Semc i r eba. d aS l ei f ebas at ar eben S l ei f -f ar c xebi T .

m o t k e p n a (gabekva). motkepnis dros xdeba niadagis gamkvriveba, beltis daSla

d a z ed api r i s mo s wo r eba.

motkepnis dros xdeba Teslisa da niadagis erTmaneTTan SekavSireba da iqmneba

xel sayr el i pi r o bebi T es l i s T anabar i aRmo nac eni s mi s aR ebad . motkepnas axdenen specialuri satkepnebiT. arsebobs sxvadasxva tipis satkepnebi. esenia: 1. cilindruli gluvzedapiriani, 2. rgolebiani, 3. dezebiani, 4. Wdeuli sagoravebi.

m iw i s S e m o y r a. miwis Semoyras awarmoeben ZiriTadad saToxni kulturebis naTesebSi, romlis mizania sarevelebis moWra, niadagis gafxviereba, miwis ESemoyris Sedegad kartofils gamoaqvs damatebiTi wamonazardebi, romelzedac warmoiqmneba tuberebi da izrdeba misi mosavali. miwis Semoyris SemTxvevaSi siminds gamoaqvs damatebiTi sahaero fesvebi, riTac ukeT emagreba niadags da iZens met simagres da i c avs waqc evi s gan qar i s d r o s .

d i s k o e b i a n i f a r c x e b i karg Sedegs iZleva gako r d ebul i , yami r i d a

nawver al i s S emT xvevaS i . us t r uqt ur o , mZi me T i xa ni ad agebi s d as af ar c xad .

r o t a c i u l i f a r c x i a n u T o x i warmoadgens kultivatorebsa da farcvxebs Soris gardamaval iaraRs, igi saukeTeso saSualebaa niadagis zedapiris gasaf xvi er ebl ad .

## ni ad agi s d amuSavebi s s i s t emebi

mcenareTa zrda ganviTarebisaTvis xelsayreli pirobebis Seqmnis mizniT Catarebuli niadagis damuSavebis sistema gulisxmobs urTierT dakavSirebul agroteqnikuri xer xebi s gar kveul er T o bl i o bas a d a T anmi md evr o bas .

niadagis damuSavebis sistema ar aris mudmivi, masSi cvlilebebis Setana xdeba sxvadasxva zonaSi niadagur klimaturi pirobebis, mosayvani kulturis biologiuri T avi s ebur ebebi s gaT val i s wi nebi T . ni ad agi s d amuSavebi s s i s t emas yo f en S emd eg j guf ebad : 1. ni ad agi s mz r al ad anu sagaz af xul o kul t ur ebi s aT vi s d amuS avebi s s i s t ema, 2. ni ad agi s damuSavebis sistema saSemodgomo kulturebisaTvis. 3. niadagis Tesviswina da Tesvis Semdgomi damuSavebis sistema. 4. niadagis aneulad damuSavebis sistema. 5. yamiri miwebis damuSavebis sistema, 6. buCqnarebis da daWaobebuli niadagebis damuSavebis sistema da sxva. unda aRiniSnos, rom niadagis damuSavebis mocemuli klasifikacia ar aris sruli vi nai d an i s ar mo i c avs ni ad agi s d amuSavebi s s i s t emas z o nebi s mi xed vi T . mzralad damuSavebis ramdenime saxe arsebobs: 1. nawverlis damuSavebis sistema. 2. saToxni kulturebisagan ganTavisuflebuli nakveTis damuSavebis sistema, 3. ko r d i s d amuSavebi s s i s t ema.

**nawver l i s d amuSavebi s s i s t ema.**

nawverali aris TavTaviani kulturebis mosavlis aRebis Semdeg narCeni. nawver l i s

d amuSavebi s mizania: niadagis zedapiris gafxviereba, mosuli naleqebis srulyofilad

S T anT qma, niadagis wylisa da sakvebis reJimis regulireba. niadagis dasarevlianebisa da

mavnebel d aavad ebebi s ker ebi s mo spo ba.

aqve unda SevexoT nawverlis damuSavebis sakiTxs mzralad damuSavebis sistemaSi zonebis mixedviT. gvalvian da urwyav raionebSi aCeCva dadebiT Sedegs ar iZleva, radganac winamorbedi kulturis aRebis Semdeg Zalian gamomSralia da sarevelebis T es l ebi ar R i vd eba. as eT pi r o bebS i aCeCvi s S emd eg ni ad agi und a mo i r wyas .

aCeCvidan 2-3 kviris Semdeg niadagi ixvneba winmxvneliani guTniT, 22-25 sm siRrmeze. f er d o bebi s d amuSavebi s S emT xvevaS i xvna d aqanebi s gar d i gar d mo mi mar T ul ebi T t ar d eba, r aT a ni ad agi d ac ul i qnas er o z i ul i pr o c es ebi s agan.

## s aT o xni kul t ur ebi sagan ganT avi s uf l ebul i nakveT i s

**mzralad damuSavebi s s i s t ema**.

saToxni kulturebi SedarebiT gvian anTavisufleben nakveTs, saToxni kulturebi niadags fxviers da naklebad dasarevlianebuls toveben. amitom xSir SemTxvevaSi mo xvni s nac vl ad , S ei Zl eba Cavat ar o T ao Sva 10-12 s m, an bel t i s gad aubr unebl ad xvna.

saToxni kulturebis Semdeg Tu kvlav saToxni kulturebis Tesvaa gaT val i s wi nebul i , maS i n auc i l ebel i a ni ad agi s R r mad d amuSaveba.

Warbtenian raionebSi saToxni kulturebis Semdeg mizanSewonilia niadagis damuSaveba gadavitanoT gazafxulisaTvis. aseTi pirobebia kolxeTis dablobze, sadac uxvnaleqianobisa da gruntis wylis niadagis zedapirTan siaxlovis gamo SeiZleba d aWao bebas hqo nd es ad gi l i .

aseve gazafxulze xvna dasaSvebia mTian pirobebSi msubuqi Sedgenilobis niadagebze. es SeiZleba gamarTlebuli iyos imiT, rom SemodgomiT moxnuli niadagi ad vi l ad S ei Zl eba Cai r ec xo s .

**ko r d i s d amuSavebi s s i s t ema.**

mravalwliani balaxebis mkvdar da cocxali narCenebiT daqselil zeda fenas kords uwodeben. kordisTvis damaxasiaTebelia niadagis didi simkvrive, miT ufro mkvrivia is rac ufro didi xnis mouxnavia. kordi damaxasiaTebelia yamiri da nasveni mi webi s aT vi s . kordis damuSavebis ZiriTadi amocanebia: 1. moispos kordis sicocxlisunarianoba; 2. Seiqmnas kordis daSlis xelsayreli pirobebi da gaumjobesdes niadagis wyalmarTvi, haer o vani d a kvebi T i r eJ i mi ; 3. s ar evel ebi s d a maT i veget ac i ur i o r gano ebi s mo s po ba.

ganasxvaveben bunebriv da xelovnur kords: bunebrivi kordi yalibdeba velurad mozardi balaxeuli mcenareebis dgomis Sedegad. xolo xelovnuria kordi roca i T eseba mr aval wl i ani bal axebi o r i d a met i wl i s ganmavl o baS i .

kordis damuSavebaze mecnierebis mier mravali xerxi gamoicada, romelTagan

mxo l o d wi nmxvnel i ani guT ni T d amuSavebam gaamar T l a.

**yami r i d a nas veni mi webi s d amuSavebi s s i s t ema**

mr aval wl i ani balaxebiT umetesad dafarul, auTvisebel, mouxnav miwis nakveTs yamiri ewodeba. xolo iseT miwis nakveTs, romelic damuSavebis Semdeg xangrZlivi droiT mitovebul iqna nasvens uwodeben. yamiri da nasveni miwebi xasiaTdebian maRali nayo f i er ebi T , aqed an gamo md i nar e maT i aT vi s ebas d i d i mni S vnel o ba aqvs . ko r d i md i d ar i a mcenarisaTvis saWiro yvela sakvebi elementebiT, Tumca yvela isini mcenarisaTvis SesaTvisebel farmaSi ar imyofeba. kordSi arsebuli sakvebi nivTierebebi SesaTvisebel formaSi, rom gadavidnen amisaTvis saWiroa ganicadon mineralizacia (daSla). sakvebma nivTierebebma mineralizacia, rom ganicadon amisaTvis saWiroa baqteriebis cxovelmyofeloba. amisaTvis ki saWiroa aerobuli pirobebi. kordSi haeri da Jangbadi ar moZraobs. amitom saWiroa Catardes niadagis gafxviereba, ise rom koStovani struqtura ar daiSalos. yamiri da nasveni miwebi ganicdian tenis naklebobas, amitom maTi damuSavebisas aucilebelia SenarCunebul iqnas mtkice koStovani struqtura da d agr o vi l i qnas ni ad agS i t eni .

yamiri da nasveni miwebi unda moixnas aucileblad winmxvneliani guTnebiT, belti

kar gad und a CakeT d es ni ad agS i , es S esaZl ebel i a mxo l o d R r ma xvni T .

kordis Cveulebrivi xvna 25-30 sm-ia. Tu nakveTi Zlier dasarevlianebulia mravalwliani fesuriani sarevelebiT maSin jer diskoebiani farcxiT unda daifarcxos da Semdeg unda moixnas. swori agroteqnikis pirobebSi yamiri da nasveni miwebi didxans i nar Cuneben maRal nayo f i er ebas .

## ni ad agi s aneul ad d amuSavebi s s i s t ema

aneuls uwodeben gansazRvruli drois ganmavlobaSi dauTesavad datovebul nakveTs, romelic dasvenebis periodSi sistematiurad muSavdeba, raTa gaumjobesdes misi nayofiereba, ukeT momaragdes wyliTa da sakvebi nivTierebiT. damuSavebis sistema gans xvavebul i a i mi s d a mi xed vi T , T u r o mel i wi namo r bed i s S emd eg und a d ai T es o s es a T uU is saSemodgomo kultura. saSemodgomo Tesvas awarmoeben ZiriTadad aneulze, kordze, saToxni kulturebis Semdeg da nawveralze. amasTan aneulis TeslbrunvaSi CarTvas sarevela mcenareTa raodenobis Semcirebasa, niadagis nayofierebis amaRlebasa da kul t ur ul i mc enar eT a mo s avl i ano bi s gaz r d i s s aqmeS i d i d i mni Svnel o ba aqvs .

aneulebi or gjufad iyofa: sufTa da moTesili. sufTa aneuli Semodgomisaa da d auT es avia gazafxul-zafxulis periodSi (Semodgomodan-Semodgomamde) da masze iTeseba saSemodgomo kultura mxolod momdevno wels. magram sagazafxulo kulturasac Tesaven iq sadac saSemodgomo Tesavas ar mimarTaven. adre asaRebi kulturebi moTesil aneulebze gazafxulze iTeseba, romlebic xels ar uSlian mindvris gaaneulebis amocanebis Sesrulebas. iq sadac sakiTxi dgas soflis meurneobis intensifikaciis Sesaxeb, sufTa aneuli Sesaferis klimatur pirobebSi ad gi l s uT mo bs mo T es i l aneul s , mS r al ur wyav ad gi l ebS i . s uf T a aneul i s gamo yeneba ki uf r o mi z anS ewo ni l i a

**ni ad agi s aneul ad d amuSaveba.**

rodesac nakveTi savegetacio periodis ganmavlobaSi Tavisufalia mosayvani

kulturisagan, xolo niadagi aris damuSavebuli, fxvieri da sarevelebisagan sufTa - sufTa aneuls uwodeben. aseT nakveTze wlis ganmavlobaSi sasoflo-s ameur neo pr o d uqc i i s mi R eba ar xd eba. sufTa aneuls yofen Semdeg saxeebad: a) saSemodgomo anu Savi aneuli,

b) s agaz af xul o anu ad r eul i aneul i , g) sagvi ano aneul i .

nawverlis winaswari aCeCvis Semdeg, saSemodgomo aneulisaTvis, Semodgomaze

warmoebs ZiriTadi xvna, xolo momavali wlis Semodgomamde mindori “gad aS avebul i a”, amitomac mi i R o Savi aneul i s saxel wo d eba.

saadreo aneulis efeqturoba mkveTrad izrdeba im SemTxvevaSi Tu Semodgomaze CavatarebT aCeCvas, xolo gazafxulze droulad movxnavT. xvna warmoebs winmxvneliani guTniT, erTdroulad atareben farcxvasac. sarevelebis gamoCenisTanave atareben aoSvas diskoebiani saoSiT, ivnisis dasawyisSi atareben Rrma xvnas guTniT, e.i. beltis gadaubruneblad 40-50 sm –is siRrmeze, farcxviT, zafxulis ganmavlobaSi sar evel ebi s ganviTarebis mixedviT. sarevelebis gamoCenis SemTxvevaSi Tesvis win niadagi unda damuSavdes TaTebiani “zigzagebiani” farcxiT da iTeseba sagazafxulo kultura Semdeg, 3- 4 wlis ganmavlobaSi nakveTi ar ixvneba, sagazafxulo kulturis mosavlis aRebis Semdeg 7-8 sm siRrmeze tardeba 1-2 dadiskoeba, gazafxulze nakveTi daifarcxeba d a d ai T es eba.

beltis gadaubruneblad moxvna yvelgan gamarTlebuli ar aris, is damokidebulia niadagis tipze. aseTi wesiT niadagis damuSaveba miRebulia mxolod sarevelebisgan sufTa struqturian niadagebze. beltis gadaubruneblad moxvna dasarevlianebis gad i d ebas i wvevs . saadreo aneulis moxvnis vadebi adgilobriv pirobebisda mixedviT cvalebadobs. saukeTesod iTvleba xvna april–maisSi, an araugvianes ivnisis pirveli dekadisa. adreul aneulebze organuli sasuqi SeaqvT ZiriTadi xvnis win, an momdevno gadaxvnis win. xnulis Semdgomi damuSaveba zafxulisa da Semodgomis ganmavlobaSi, imave wesiT d a i mave vad ebS i t ar d eba, r o go r c S avi aneul i s d amuSavebi s as .

sagviano aneuls winaT farTod iyenebdnen erTpirovnuli glexuri meurneo bi s

pirobebSi. moxvnamde mindori abalaxebuli iyo da saZovrad gamoiyeneboda, Zovebis dros mindori itkepneboda, uaresdeboda niadagis fizikuri Tvisebebi, xvnas gvian awarmoebdnen, xnuli uxarisxo iyo da saSemodgomo TesvisaTvis ver aswrebda mo mwi f ebas . ami t o m as eT i aneul ebi agr o R o ni s Zi ebebi d an amo Rebul i qna.

## kulisebiani aneuli

sufTa aneulis saxesxvaobas kulisebiani aneuli warmoadgens im gansxvavebiT, rom Semodgomaze moxnul mindorze gazafxul-zafxulSi kulisebad–z o l -zolad iTeseba maRalReroiani mcenareebi, Tovlis dagrovebis, yinvisa da qar i s agan s aSemo d go mo naT es i s d ac vi s mi z ni T .

kulisebiani aneulis ZiriTadi daniSnulebaa maRalReroiani mcenareebis Tesvis saSualebiT mindvrebze Tovlis Sekaveba da niadagSi tenis maragis gadideba. amitom kulisebian aneulebs iyeneben mSral raionebSi, sadac mcireTovliani mkacri da masTan qariani zamTari icis, tenianobis gadidebis garda aseTi aneuli Tovlis saburvelis gadidebis gamo xels uwyobs temperaturuli reJimis gaumjobesebas da saSemodgomo kul t ur ebi s ukeT gamo z amT r ebas .

sakuliso mcenareebad miCneulia simindi, mzesumzira, sorgo da sxva maRalReroian mcenareebi, iTeseba mwkrivebad, zamTarSi gabatonebuli qarebis sawinaaRmdego mi mar T ul ebi T d a mwkr i vebi s er T i meo r i sagan 10-20 met r i s d aS o r ebi T .

am mcenareTa mwkrivebs kulisebi ewodeba, xolo manZils maTSoris kulisTaSorisi manZili. kulisebSi mcenareTa Soris mwkrivebSi manZili iseTive unda i yo s , r ac s aer T o d mi Rebul i a. kul i s ebi Sei Zl eba i yo s er T i , o r i , an s ammwkr i vi ani . er T i da ormwkriviani kulisebi ufro ukeTesia agroteqnikuri TvalsazrisiT. sam mwkriviani kulisebi ver qmnian nakveTze Tovlis Tanabar safars da miuRebelia agroteqnikur RonisZiebaTa gatarebis siZnelis gamoc, radgan kulisebSi mcenareTa movla zedmet d r o s a d a S r o mas mo i T xo vs .

sakulise kulturebis mosavlis aRebis Semdeg Reroebs ar Wrian, aramed ise

t o veben T o vl i s S es akavebl ad , gaz af xul z e ki qar ebi s per i o d i s gavl i s S emd eg Wr i an d a gamo aqvT nakveT i d an.

bolo dros bevr gvalvian raionSi sakuliso mcenareebs Tesaven ufro gvian zafxulSi, ivlisis meore naxevarSi, es iZleva saSemodgomo pureuli kulturebis sakuliso mcenareebis mwkrivebis gardigardmo mimarTulebiT Tesvis saSualebas, maT dauzianebliv, radgan am dros sakuliso mcenareebis simaRle aRwevs mxolod 25-40 sm. am SemTxvevaSi miwis farTobs mTlianad iyeneben; Tovli kargad grovdeba da Tanabrad nawildeba nakveTze. zafxulSi Tesvis SemTxvevaSi sakuliso mcenare ar iZleva mosavals, magram Tovlis Sekavebisa da dagrovebis daniSnulebas kargad asrulebs da mo s aval sac z r d i s .

## mo T es i l i aneul ebi

sufTa aneulebis agroteqnikuri mniSvneloba niadagis nayofierebis gadidebis saqmeSi, gansakuTrebiT sarevelebTan brZolaSi, metad didia. magram ekonomiurad igi misaRebia mxolod mSral raionebSi, sadac naleqebis wliuri raodenoba mcirea da maRali mosavlis miRebas ver uzrunvelyofs. sufTa aneulze ori wlis ganmavlobaSi mxolod erTi mosavlis miReba SeiZleba. niadagis erTi wliT “mocdena” yvela meurneobisaTvis mizanSewonili ar aris, radgan TesvisaTvis gamosayenebeli farTobi mc i r d eba.

TavianT agroteqnikur daniSnulebas moTesili aneulebi im SemTxvevaSi gaamarTleben, Tu sworad iqneba SerCeuli mosaTesi kultura, gavanoyierebT mindors da CavatarebT maRal agroteqnikas. aneulze daTesili kultura mokle vegetaciis unda iyos, raTa mosavlis aRebis Semdeg droulad da xarisxianad damuSavdes niadagi saSemodgomo kulturis TesvisaTvis. garda amisa mosaTesi kultura niadags ar unda fitavdes wyliTa da sakvebiT, did gavlenas unda axdendes Tavisi biologiuri TaviseburebebiT da agroteqnikiT niadagis nayofierebis gadidebaze. aseTebia pirvelrigSi erTwlovani parkosani kulturebi (cercvela, culispira, barda, ospi, xand ur i da sxva), saToxni kulturebi (kartofili, sasilose simindi, sakvebi baRCeulebi, saTesle Zirxvenebis meore wlis nargavebi da sxva) kargia agr eT ve s amar c vl e par ko s nebi (l o bi o , mar d a, s o i a d a s xva.) bunebrivi klimaturi pirobebisa da dasarevlianebis xasiaTis mixedviT sxvadasxva saxis moTesil aneulebs iyeneben: arasaToxni kulturebiT moTesili, saToxni kul t ur ebi T mo T es i l i d a s i d er al ur i aneul ebi .

## sideraluri aneuli

sideraluri aneuli sakmaod gavrcelebuli saxea. sideraluri aneulis mi nd o r z e daTesili parkosani kulturebis (xanWkola, barda, culispira, soia, cercvela, Citifexa, ZiZo da sxva) sideratebi, rogorc wvane sasuqebi bunebriv, anu sameurneo sasuqTa Soris didi yuradRebis Rirsia. sideratebis gamoyenebas gansakuTrebuli yuradReba eZleva agroteqnikur RonisZiebaTa sistemaSi, rogorc maRalefeqturs, iafsa da advilad gasatarebel RonisZiebas. sasoflo sameurneo literaturaSi sideratebis cnebis qveS igulisxmeba iseTi agronomiuli RonisZiebaxer xi , r o ml i s s aSual ebi T vaumj o bes ebT mc enar eT a kvebi s r eJ i ms ni ad agS i Caxvni s gz i T .

sideratebi- mwvane sasuqad gamoyenebis mxriv SeiZleba daiyos or jgufad: sruli

mwvane sas uqi , r o c a ni ad agS i Cai xvneba mwvane mas i s mi wi s z ed a nawi l i f esvT a s i s t emasT an erTad da meore arasruli mwvane sasuqi –rodesac mcenaris miwiszeda nawilis sxva daniSnulebisamebr gamoviyenebT (Tivad, silosad sxva adgilze gadasatanad da Casaxnavad) da marto fesvTa sistemas CavxnavT niadagSi. niadagis nayofierebis gadidebis saqmeSi es aneuli did efeqts iZleva metadre msubuqi meqanikuri Sedgenilobis niadagebze (msubuqi Tixnarebi, qviSnarebi, qviSebi) sakmaod tenian raionebis porobebSi an sarwyav miwebze. sideratebis aneulad gamoyeneba karg Sedegs iZleva agreTve ustruqturo mZime meqanikuri Sedgenilobis, niadagebzec. aneulze moTesili sideratebi xels uwyoben, agreTve sakvebis Zneladxsnadi SenaerTebis gadasvlas mcenarisaTvi s uf r o mi s awvd o m f o r maS i , si d eratebi niadagidan mineraluri s akvebi s gamo r ec xvas amc i r ebs .

sideratebiT moTesili aneulebi xels uwyoben mindvrebis sarevela mcenarebisgan gawmendas, rac gamoixateba imaSi, rom kargad ganviTarebuli sideratebiT niadagi s zedapiri mTlianad ifareba (iCrdileba) mwvane masiT da iwvevs sarevelebis CaxSobas. sideratebad iyeneben, rogorc parkosan, ise marcvlovan kulturebs da xSirad maT narevsac, magram umTavresi mniSvneloba mainc parkosan mcenareebs ekuTvnis. parkosnebs unari SeswevT koJris baqteriebis saSualebiT gamoiyenon atmosferos Tavisufali azoti da amgvarad gaamdidron niadagi am mniSvnelovani da ZiriTadi sakvebi elementiT. mravali avtoris gamokvlevaTa mixedviT parkosani kulturebi azotis 65-75% iTviseben haeridan, xolo danarCen 25-35% niadagidan. amgvarad parkosnebs mwvane sasuqad gamoyenebis saqmeSi didi upiratesoba aqvT marcvlovan mcenareebTan S ed ar ebi T .

rogorc avRniSneT, sideratebis CaxvniT, niadags vamdidrebT organuli nivTierebiT da azotiT, ris safuZvelzec umjobesdeba niadagis fizikur-qimiuri da mikrobiologiuri procesebi. sasideratod gamosayenebeli mcenareebi Rrmad inviTareben fesvTa sistemebs, afxviereben niadagis qveda fenebs, amoaqvT iqidan mcenareTaTvis aucilebeli sakvebi nivTierebani, xolo zogierTi Znelad xsnadi ni vT i er ebani ad vi l ad S es aT vi s ebel i xd ebi an mo md evno kul t ur ebi saT vi s .

cnobilia, rom organuli sasuqis ZiriTad warmomadgenlad nakeli iTvleba, magram arsebobs mTeli rigi literaturuli monacemebi imis Sesaxeb, rom mwvane sasuqi ara Tu ar CamorCeba, aramed xSir SemTxvevaSi upiratesobasac ki amJRavnebs nakelis winaSe. jer erTi, sideratad daTesili adgilzeve moyvanilia da iqve Caixvneba niadagSi d a ar saWi r o ebs ar avi T ar t r anspo r t s gad asat anad .

soflis meurneobaSi sideratebis mwvane sasuqad gamoyenebas mravalsaukunovani

istoria aqvs. am drois ganmavlobaSi maTi dadebiTi moqmedeba sasoflo-s ameur neo kulturebis mosavlianobis zrdis TvalsazrisiT mravaljer iqna dadasturebuli. amJamad, sideratebi perspeqtiul agroteqnikur RonisZiebaTa sistemaSi Sedis da warmoebaSi farTod unda dainergos, rogorc niadagis nayofierebis gamaumjobesebeli s aS ual eba, r o mel i c xel s uwyo bs eko l o gi ur ad s uf T a maRal i mo savl i s mi R ebas .

**ni adagi s T esvi s wi na damuSavebi s s i s t ema.**

niadagis Tesviswina damuSavebaSi igulisxmeba garkveuli TanmimdevrobiT Sesrulebuli damuSavebis wesebis erToblioba niadagis dasaTesad mosamzadeblad. igi (kul t i vac i a, d ad i s ko eba, farcxva) unda Catardes mxolod daTesvis dRes, rac adidebs kulturis konkurentunarianobas sarevelebTan Sedar ebi T . Tu erTmaneTs daSordeba Tesviswina damusaveba da Tesva, maSin sarevelebi adre aRmocendebian, vidre mosayvani kul t ur ebi d a ganvi T ar d ebi an maT z e ukeTesad. T u T es vi s wi na kul t i vac i i s S emd eg wvi mi s mosvlis an sxva mizezis gamo SeuZlebelia Tesvis Catareba, aucilebelia ganmeordes Tesviswina damuSaveba. Tesviswina damuSavebis dros ar aris rekomendebuli niadagis gad abr uneba.

niadagis damuSavebis konkretuli wesebi ganisazRvreba mTel rig pirobebze damokidebulebiT: mzralad xvnis CatarebiT, dasaTesi kulturiT (adre an gvian dasaTesi), organuli sasuqebis SetaniT da sxva. mxedvelobaSi miiReba agreTve met eo r o l o gi ur i pi r o bebi d a ni ad agi s meqani kur i Sed geni l o ba.

Tesvis wina damuSaveba sagazafxulo kulturebisaTvis unda daiwyos adre gazafxulze farcxvis CatarebiT msubuq niadagebze da kultivacia-farcxviT mZime niadagebze. Tesvamde damuSavebebi sxvadasxvanairia mZime da msubuqi niadagebisaTvis, s xvad as xva vad aS i d as aT es i kul t ur ebi saT vi s .

**ni ad agi s T es vi sSemd go mi damuSavebi s s i s t ema.**

ni ad agi s T esvi s Semd go mi d amuSavebi s amo c anaa-Seqmnas mcenareTa aRmocenebisa da maTi Semdgomi ganviTarebis optimaluri pirobebi; uzrunvelyos mcenareTa saWiro sixSire; daicvas niadagis wyali aorTqlebisagan, gaaumjobesos niadagis haeracia da masTan dakavSirebuli sasargeblo mikroorganizmebis cxovelmoqmedeba; mospos s ar evel a mc enar eebi .

niadagis TesvisSemdgomi damuSavebis ZiriTadi RonisZiebebia: motkepna, farcxva,

mwkr i vT S o r i s ebi s d amuS aveba d a mi wi s S emo yr a.

motkepna tardeba Teslisa da niadagis zedapiris mosasworeblad da qveda fenebSi tenis SesanarCuneblad. motkepna unda Catardes saSemodgomo da sagazafxulo kul t ur ebi s T es vas T an er T ad , and a umal T esvi s S emd eg.

farcxva uzrunvelyofs niadagis zedapiris gafxvierebas, niadagis zedapiris

mo s wo r ebas d a nawi l o br i v s ar evel ebi s mo s po ba.

niadagis zedapirze warmoqmnili qerqis daSlis mizniT aRmocenebamde mindori unda daifarcxos kbilebiani farcxiT. mcenareTa aRmonacenSi ki niadagis dasamuSaveblad gamoiyeneba rotaciuli maToxari, romelic afxvierebs niadags da kulturul mcenareebs ar azianebs, saSemodgomo TavTaviani pureuli ifarcxeba gaz af xul z e-bartyobis fazaSi, rodesac mcenareebi kargadaa momagrebuli, gamoiyeneba r o t ac i ul i maT o xi an kbi l ebi ani f ar c xi .

saT o xni kul t ur ebi i f ar c xeba aRmo c enebamd e d a aR mo c enebi s S emd eg, Cveul ebr i vi

kbilebiani farcxebi gamoiyeneba aRmocenebamde niadagis dasafarcxavad iseT kulturebSi, romelic Rrmad 8-10 sm siRrmeze iTeseba (simindi, kartofili da sxva), zereled saTesi kulturebis aRmocenebamde dafarcxvisaTvis gamoiyeneba mo kl ekbi l ebi ani ms ubuqi f ar c xebi .

dafarcxvis saSualebiT xdeba saToxni kulturebis gameCxereba da sixSiris

regulireba.

saToxn kulturebSi niadagis damuSavebis ZiriTadi xerxia mwkrivTSorisebis kultivacia, mcenareTa vegetaciis dros, mwkrivTSorisebis damuSavebis siRrme da ricxvi damokidebulia kulturis biologiur Taviseburebebze, naTesebis d asar evl i anebaz e, ni ad agz e d a ami nd i s pi r o bebz e.

miwis Semoyra uzrunvelyofs niadagis ukeTesad gaTbobas da Warbi tenis d awretas, xelsayrel pirobebs qmnis mcenarisaTvis misawvdomi sakvebi nivTierebebis dagrovebisaTvis miwis Semoyras iyeneben kartofilis kulturaSi, damuSavebis es wesi aumjobesebs tuberebis warmoqmnis pirobebs. simindSi,mzesumziraSi, pomidorSi-xels uwyobs fesvTa sistemis ganviTarebas. gvalvian raionebSi mizanSewonili araa mwis Semoyra, radganac amaorTqlebeli zedapiris gazrdis gamo teni didi raodenobiT i kar geba. gval vi an r ai o nebS i mi wi s S emo yr a und a S ei c val o s Cveul ebr i vi gaf xvi er ebi T .

saSemodgomo kulturebSi gamoyenebulia naTesebis Semodgoma-zamTris movlis

agr o t eqni kur i R o ni s Zi ebebi .

xs i r ad xd eba s aS emo d go mo kul t ur ebi s gameCxer eba d az o gj er mT l i anad d aR upva

danestianebisa da Caxurebisagan. danestianebis winaaRmdeg mimarTaven dakvalvas, zog S emT xvevaS i ki T xemebz e T es vas .

saSemodgomo kulturebis gadazamTrebaze uaryofiTad moqmedebs dabali

t emper at ur a d a mc i r e T o vl i s s abur vel i . mo yi nvi s T avi d an ac i l ebi s mi z ni T mi mar T aven T o vl i s d akavebas . amoCris SemTxvevaSi saWiroa naTesis motkepna rgolebiani satkepnelebiT. rgolebian

s at kepnel ebs i yeneben agr eT ve yi nul i s qer qi s wi naaR md eg.

iseT mindvrebze, sadac Tovlis saburveli maRalia, dnobis daCqarebis mizniT z ed api r z e ayr i an t o r f s .

## T es l i da T es va

Tesli mcenaris biologiuri da sameurneo Tvisebebis matarebeli organizmia. amitom maT xarisxze mniSvnelovan wilad damokidebulia miRebuli mosavlis sidide da xar i s xi .

arCeven Teslis jiSur, TesviT da mosavlianobiT Tvisebebs. jiSur memkvidreobiT TvisebebSi igulisxmeba maTi kuTvnileba garkveul jiSTan, jiSuri siwminde, reproduqcia, tipiuroba (jvaredin damamtverianeblebSi), mromlebic isazRvreba mindvrad aprobaciis Sedegebis mixedviT. jiSianad cnobili naTesebi ekuTvnian jiSuri siwmindis garkveul kategorias. pirvel kategorias ekuTvnian jiSebi, romlebsac aqvT j i S ur i s i wmi nd e ar anakl eb 99,5%, meo r es -98 d a mes ames 95%.

sawarmoo pirobebSi sasoflo-sameurneo kulturebis maRali mosavlis miReba SesaZlebelia mxolod daraionebuli, yvelaze ufro Zvirfasi jiSebisa da hibridebis TesviT. droTa ganmavlobaSi gamoyvanili jiSebi da hibridebi uaresdeba, romelic xdeba meqanikuri an biologiuri dasarevlianebis Sedegad, agroteqnikis dabali doniT da a.S. amitom Zveli jiSebi da hibridebi jiSTa gamocdis Sedegebis safuZvelze, gar kveul i d r o i s gavl i s S emd eg i xs nebi an d ar ai o nebi d an.

axali jiSebi ramdenime gadaTesvis Semdeg amcireben TavianT xarisxs, amitom unda moxdes jiSTa ganaxleba- jiSiani Teslis Secvlas igive jiSis TeslebiT ukeTesi xarisxiT, ufro maRali TesviTi Rirsebis mqone Tesls elitas uwodeben, xolo misi Tesvis Sedegad miRebuls- pirvel reproduqcias, ukanasknelis Tesvis Sedegad- meo r e r epr o d uqc i as d a a.S .

dasaTesad Zlier mniSvnelovania, rom SeirCes maRali TesviTi Rirsebis mqone T es l i . T es vi T i T vi s ebebi s qveS i gul i sxmeba T es l i s T vi s ebaT a d a ni SanT a er T o bl i o ba (s i wmi nd e, aRmo c eneba, gaR i vebi s ener gi a, d a s xva).

maT sazRvraven Teslis partiidan aRebuli saSualo nimuSis analiziT,

s t and ar t i T d ad geni l i wes ebi s z us t ad d ac vi T .

## T es l i s xar i s xi

**Teslis siwmindeSi** igulisxmeba ZiriTadi kulturis Teslis masa, gamoxatuli procentobiT. magaliTad 100g saTesle masalaSi 95 g sufTa Teslis masa Seadgens 95%s d a nar Ceni 5 g –s , pr o c ent i i qneba c o c xal i d a mkvd ar i mi nar evebi (mi wa, Cal a, T es l i , r o mel sac aR mo c enebi s unar i ar a aqvs , mwer ebi , Wupr ebi d a s xva.

Tesls Sesabamisi manqanebiT wmenden da axarisxeben saTesle nakveTebidan mo s avl i s aR ebi s T anave.

**Teslis simsxo** biologiuri araerTgvarovnebis gamo, agreTve amindis pirobebze da agroteqnikaze damokidebulebiT, erTi da igive kulturis Teslis simsxo SeiZleba gansxvavebuli iyos. rac ufro msxvilia Tesli, miT ufro sicocxlisunarian mcenares i Zl eva. mocemuli maCvenebeli xasiaTdeba 1000 marcvlis masiT gramebSi. igi meryeobs mniSvnelovan farglebSi kulturaze da moyvanis pirobebze damokidebulebiT ( mag. xo r bal S i 32-50).

**Teslis gamoTanabrebuloba.** mxolod gamoTanabrebuli TesliT naTesi iZleva erTgvarovan aRmonacens, rac did rols TamaSobs SemdgomSi yvela mcenaris ganviTarebaSi. Teslis zomis mixedviT gamoTanabreba miiRweva Teslis sawmendi manqanebi T d axar i sxebi T .

**Teslis tenianoba.** umetesi kulturebis Teslis normaluri tenianoba tolia 14-18%isa. ufro maRali tenianobisas maT SeiZleba dakargon Senaxvis procesSi aRmocenebis unar i , ami t o m saWi r o a d amat ebi T gaS r o ba.

**Teslis aRmocenebad** iTvleba 100 cali Teslidan normalurad gaRivebuli Teslis raodenoba, romelic gamoixateba %-i T . Teslis siwmindeze da aRmocenebazea damokidebuli Teslis sasoflo- sameurneo vargisianoba, raSic igulisxmeba Teslis partiaSi ZiriTadi kulturis Teslis Semcveloba (procentobiT), romelsac aqvs no r mal ur i aRmo c enebi s unar i . mas T esvi s no r mi s gaangar i S ebi saT vi s i yeneben.

T es l i s s ameur neo var gi s i ano ba i saz R vr eba f o r mul i T :

Q= AX B: 100.

s ad ac Q ar i s – sameur neo var gi s i ano baa (%)

1. – T es l i s s i wmi nd e (%-i T )
2. –T es l i s aR mo c eneba (%-iT)

magaliTad Tu Teslis siwminde 98,7 %-ia da aRmoceneba 92,3%, maSin sameurneo vargisianoba iqneba Q= AXB: 100 = 98,7X92,3:100=91%. am SemTxvevaSi Tesvis norma unda gad i d d es 9 %-iT.

sawyobebSi Teslis normalurad SenaxvisaTvis didi mniSvneloba aqvs mis tenianobas. radgan maRali tenianobis dros Tesli SeiZleba Caxurdes, daavaddes s o ko ebi T , mavnebl ebi T d a T esl i d akar gavs aRmo c enebi s unars.

Teslis xarisxis Sefasebisa da Tesvis normis dadgenisaTvis praqtikaSi didi mniSvneloba aqvs 1000 cali Teslis masis sidides (wonas). misi maCveneblebi SesaZleblobas iZleva dadgindes Teslis dasruleba, masSi samarago nivTierebebis S emc vel o ba d a T es l i s T es vi T i xar i s xi ano ba.

**gaRivebis energia da mindvruli aRmoceneba.** pirveli 3-4 dRis ganmavlobaSi gaRivebul Teslebis raodenoba gviCvenebs mocemuli kulturisa da jiSis Teslis gaRivebis energias (erTdroulobas) procentebSi. maRali gaRivebis energiis Tesli ufro Tanabrad aRmocendeba, ukeTesad iyeneben zrdis faqtorebs, maTi aRmonaceni nakl ebad i Cagr eba sar evel ebi T , uf r o gamZl eni ar i an ar axel Semwyo bi pi r o bebi s ad mi .

dabali aRmocenebisunariani Tesli, romelsac SenarCunebuli aqvs sicocxlis

unarianoba, eqvemdebareba Tbili haeriT damuSavebas, magram Tu am SemTxvevaSic ar miaRwevs aRmocenebis maCvenebeli standartis moTxovnas, is iwuneba da sasaqonlo mar c vl i s kat ego r i aS i gad i s .

**mindvruli aRmoceneba** aris Teslebis raodenoba, romlebic iZlevian aRmonacens

mindorSi, gar kveul i pr o c ent o bi T , d aT esi l i T es l i s saer T o r ao d eno bas T an Sed ar ebi T . igi damokidebulia gaRivebis energiaze. laboratoriul aRmocenebaze, agreTve agroteqnikis doneze, ekologiur pirobebze, Teslis daavadebis xarisxze da dazianebaze.

**Teslis saTesi Rirseba**. saTesle masalis saTes vargisianobaSi igulisxmeba sufTa da erTdroulad aRmocenebadi Teslebis raodenoba. saTesi Rirsebis dasadgenad s i wmi nd i s pr o c ent s amr avl eben aRmo c enebi s pr o c ent z e d a war mo ebul s yo f en 100-z e.

Teslis saTes vargisianobas adgenen mxolod kondiciuri TeslisaTvis. igi s aWi r o a S es wo r ebi s Ses at anad ama T u i m kul t ur i s T es l i s wo ni T no r maS i .

**Teslis natura** aris erTi litri Teslis masa gramebSi. rac ufro metia Teslis natura, miT metia Teslis xarisxi. Teslis naturas sazRvraven specialur sasworebze, romelTac purkebs uwodeben. yvelaze ufro gavrcelebulia metruli erTlitriani purka. erTi litri moculobis Teslis masa SeiZleba meryeobdes mniSvnelovan f ar gl ebS i mi s s i mkvr i vez e, s i wmi nd ez e, s i no t i vez e d a s xva pi r o bebz e d amo ki d ebul ebi T .

**Teslis sijansaRis gansaz Rvr a**. saTesle, sasursaTe da safuraJe marcvali unda iyos dauvadebeli avadmyofobiT da dauzianebeli mavneblebiT. Teslis analizis dros sazRvraven misi daavadebis procents avadmyofobiT (gudafSutiT da sxva, dazianebiT mavne-kuseburaTi, beRlis cxvirgrZelaTi, tkipebiT da sxva). daavadebis SemTxvevaSi dauyovnebliv iReben zomebs maTi gauvneblobisaTvis (damatebiTi gawmenda, ganiaveba, S ewamvl a d a s xva). d aavad ebul i T es l i s d aT es va, r o go r c wes i ar d ai S veba.

**Teslis momzadeba dasaTesad.** Tesvis win saWiroa saTesle masala momzaddes d asaT esad

**Teslis Semowmeba aRmocenebaze** saWiroa Catardes im mizniT, rom Senaxvis periodSi Teslma xom ar dkarga aRmocenebis unari. T esl i s S ewamvl a xd eba s o ko vani d aavad ebebi s T avi d an asac i l ebl ad . T es l s waml aven Sxamqi mi kat ebi T an amuS aveben T er mi ul i wesi T . mokle vegetaciis periodis raionebSi Teslis Canasaxis dasrulebis Semdeg, Tu civi amindebi daiWira (gansakuTrebiT es xdeba zafxulis meore naxevarSi), Tesli Cveulebrivad mosvenebis periodSi gadadis. aseTi Tesli sustad an sruliad ar aRmocendeba, vidre is ar gamova mosvenebis mdgomareobidan; mis dasaCqareblad Tesls at eni aneben d a 3-5 d R i s ganmavl o baS i aT avs eben 20-250 –md e gamT bar S eno baS i .

**iarovizaciis stadiis** gavla moiTxovs temperaturis garkveul pirobebs, is iwyeba Teslis gaRivebidan da mimdinareobs norCobis mTel periodSi. sxvadasxva jiSisa da saxis mcenareebs iarovizaciis gavlisaTvis sxvadasxva temperaturuli reJimi esaWiroeba. magaliTad, Semodgomaze daTesili saSemodgomo xorblisaTvis saWiroa dabali (1-30) temperatura-sakmao xangrZliobiT, xolo sagazafxulo xorblisaTvis S ed ar ebi T maR al i (6-70) d a mo kl e xni T .

Teslis iarovizacias didi praqtikuli da sawarmoo mniSvneloba aqvs xanmokle vegetaciis periodis mqone raionebisaTvis, sadac ar aris SesaZlebloba saSemodgomo xo r bl i d aT es o n S emo d go maz e. gaz af xul z e d aT es vi s S emT xvevaS i ki mc enar e gad i d ebul i temperaturis pirobebSi ver gadis iarovizaciis stadias, mTeli gazafxul-z af xul i s ganmavlobaSi izrdeba da nayofs (marcvals) ar iZleva. Tu saSemodgomo xorblis Tesls gazafxulze Tesvis win davatenianebT da xangrZlivad movaTavsebT sawyobSi dabali temperaturis pirobebSi, Tesli iwyebs gaRivebas, xelovnurad gadis iarovizaciis stadias da gazafxulze daTesili aseTi Tesli imave zafxuls iZleva mar c val i s mo s aval s .

**Tesva.** niadagis Tesviswina damuSavebisa da saTesle masalis momzadebis Semdeg TiTqmis erTdroulad iwyeba Tesva. misi Catarebis swor organizaciazea damokidebuli maRal i mo savl i s mi Reba. T esva es T es l i s s wo r i ganawi l ebaa s aT es f ar T o bz e.

**Tesvis vadebi** d ad geni l i agrowesebiT ama Tu im fermeruli meurneobis niadagurklimaturi pirobebisa da dasaTesi kulturis biologiur TaviseburebaTa mixedviT. Tesva unda tardebodes SemWidroebul da optimalur vadebSi. am dros Teslis aR mo c eneba uf r o er T d r o ul ad xd eba d a ukeT esad mar agd eba wyl i T .

**Tesvis norma** Teslis is woniTi raodenoba, romelic saWiroa erT heqtar farTobze dasaTesad. man unda uzrunvelyos mindorze mcenareTa iseTi sixSire, romlis drosac saukeTeso pirobebi iqmneba Seqmnili mcenarisaTvis sasicocxlo faqtorebis-t eni s , s i naT l i s , haer i s , s akvebi ni vT i er ebebi s -gamo yenebi s aT vi s .

**T es l i s CaT es vi s s i Rr mes** met ad d i d i mni S vnel o ba aqvs T es l i s d r o ul i d a T anabar i aRmocenebisaTvis, Tesvis dros Tesli unda moeqces niadagis siRrmis iseT fenaSi, sadac tenis, haerisa da siTbos optimaluri pirobebi iqmneba, Teslis gaRiveba aRmocenebisaTvis. Teslis gadaWarbebiT did, ise Zalian mcire siRrmeze CaTesva xels uSlis misi gaRiveba-aRmocenebis mimdinareobas, pirvel SemTxvevaSi Zneldeba niadagSi haeracia, Tesli xvdeba gaumTbar fenaSi, Rivi ver aRwevs siRrmidan miwis zedapirze amosvlas. mcire siRrmeze CaTesvis dros ki Tesli ver Rivdeba arasakmao tenis gamo da ad vi l ad z i and eba f r i nvel ebi s gan.

sxvadasxva kultura sxvadasxva siRrmeze iTeseba. mag. Mms xvi l i Teseli iTeseba 8-10

s m s i R r mez e, xo l o wvr i l T esli kul t ur aT a T es l ebi i T es eba 1,5-2 s m s i R r mez e.

**Tesva –dargvis wesebi.** maRali da myari mosavlis miRebas ver uzrunvelyofs verc nayofieri niadagi, verc droulad Tesva da verc kargi movla, Tu naTes nargavebSi TiToeul mcenares ar eqneba micemuli niadagis garkveuli sididis farTobi, romelsac **kvebis ares** uwodeben. yoveli mcenare Tavisi normaluri zrda ganviTarebisaTvis sakveb ni vT i er ebas , wyal s , s i naT l es d a sxva gar emo f aqt o r ebs R ebul o bs kvebi s ar i d an.

Tesvis dros an saCiTile kulturebis (kombosto, pomidori, Tambaqo da sxva) dargvis dros saWiroa TiToeul mcenares mieces Sesaferisi kvebis are. imis mixedviT Tu ra kultura iTeseba, kvebis aris sidide sxvadasxva iqneba. magaliTad TavTaviani kul t ur ebi saT vi s 25 s m2 i a, d a z o gj er met i c .

TiToeuli mcenarisaTvis kvebis aris gadidebiT gaizrdeba mosavlianoba, magram erTeul farTobze mosaval;i Semcirdeba da, piriqiT, sakvebi aris SemcirebiT, e.i. xSiri naTesis dros mosavali farTobze gaizrdeba, magram TiToeul mcenareze Semcirdeba. farTobze mosavlis zrda garkveuli raodenobis Semdeg gaauaresebs produqciis xarisxs, amitom saWiroa mcenares mivceT iseTi sakvebi are, romelic uzrunvelyofs maRali da imave dros kargi xarisxis mosavlis micemas, gaadvilebs am mcenaris mo vl as meqani z ac i i s pr o c es ebi s gat ar ebi T .

**mobneviT Tesva** uZvelesi da primitiuli wesia, igi patara farTobebze xeliT sruldeba, xolo did farTobebze Seqmnilia specialuri mombnevi saTesi manqanebi da mi s i ve saS ual ebi T S ei Zl eba mo bnevi T d ai T es o s mc enar eT a T es l ebi .

mobneviT Tesvas bevri uaryofiTi mxare axasiaTebs: Tesli uTanabrod nawi l d eba

farTobze, araTanabrad ifloba niadagis siRrmeSi, erTeul farTobze 15-20%-iT meti saTesle masala ixarjeba, SeuZlebeli xdeba naTesis movla meqanizirebuli wesiT da yo vel i ve ami s gamo i z r d eba pr o d uqc i i s T vi T R i r ebul eba.

**mwkrivad Tesva** specialur mwkrivSi mTesveli saTesi manqanebiT sruldeba. Tesvis es wesi farTodaa gavrcelebuli Cveni qveynis soflis meurneobis fermerul meurneobebSi. Tesli iTeseba swor da urTierT Tanabrad daSorebul mwkrivebSi, Teslis CaTesva xdeba erT siRrmeze da niadagis tenian fenaSi, aRmonaceni adre da erTdroulad amodis, ukeTesia mwkrivebSi mcenareTa ganaTebisa da aeraciis pirobebi, gaad vi l ebul i a naT es -nar gavebi s mo vl i sa d a mo savl i s aR ebi s pi r o bebi .

meqanizaciis saSualebaTa gamoyenebisaTvis calkeul kulturaTa biologiur TaviseburebaTa mixedviT mwkrivad Tesva, Tavis mxriv, or saxed iyofa: farTomwkrivebSi T esva, r o d esac mwkr i vebi s manZi l i s aS ual o d 30-80 sm, mwkri vebS i mc enar eT a S o r i s ki 3070 sm farglebSi cvalebadobs da viwromwkrivad Tesva- 7,5-15 ,sm-mde mwkrivTSorisebiT (mwkrivebSi mcenareTa Soris 1,5-4 sm) farTo mwkrivebSi iTeseba saToxni kulturebi

(simindi, Saqris Warxali, mzesumzira, kartofili da sxva), xolo viwro mwkr i vebS i TavTaviani kulturebi (xorbali, qeri Wvavi, Svria), sakvebi balaxebi (ionja, samyura, koindari da sxva) da zogierTi bostneuli kulturebi (ispanaxi, wiwmati, mwvanileuli da sxva).

mwkrivad Tesvisas arCeven Cveulebriv viwro mwkrivebSi Tesvas, rodesac yvela

mwkrivTSorisi Tanabari manZiliT aris daSorebuli erTimeoresTan, da jvaredinad Tesvas, rac imaSi mdgomareobs, rom Teslis norma Suaze iyofa da Cveulebrivi saTesi manqaniT Tesva mimdinareobs ori mimarTulebiT-gaswvriv da gardigardmo, mwkrivebi erTmaneTs hkveTs da gadajvaredinebulia. Tesvis es wesi saSualebas iZleva farTobze ufro Tanabrad iqnes ganawilebuli mcenareTa raodenoba, xels uwyobs sarevelebis aRmonacenis CaxSobas, naklebad orTqldeba wyali niadagis zedapiridan, umjobesdeba mcenaris mier sakvebi nivTierebebis, wylisa da mzis radiaciis gamoyeneba, mcenareebi erTmaneTs emagreba da ar xdeba yanis Cawola, amasTan er T ad j var ed i n T es vas z o gi er T i uaryofiTi mxare axasiaTebs: saTesi agregatis orjer gavlis gamo mwkrivebis gad akveT i s ad gi l as mc enar eebi Sej guf ebul i a, ni ad agi z ed met ad i t kepneba d a s xva.

**Cveulebrivi farTomwkrivebiani** wesiT Tesvis dros yvela mwkrivTSori sis manZili T anabar i a. am wes i T , r o go r c z evi T avR ni SneT i T es eba yvel a saT o xni kul t ur a.

zogierT viwromwkrivSi dasaTes kulturas (xaxvi, stafilo, TavTaviani kulturebis da sakvebi balaxebis saTesle nakveTebi), naTesebis ukeTesi movlisa da sarevelebisagan brZolis RonisZiebebis Catarebis gaadvilebis mizniT, Tesaven zoluri anu lentiseburi Tesvis wesiT. am dros ramdenime mwkrivi (2; 3; 4) daTesilia erTmaneTTan SemWidroebiT (10-15-20 sm-iT), xolo Semdeg ufro farTo manZiliT (40-50-60 sm) as eT i SemWi d r o ebul i mwkr i vebi d aS o r ebul i a er T maneT i sagan.

**farTomwkrivuli punqtirebuli** Tesvis wesi SedarebiT axali SemoRebulia. aseTi Tesvis dros mwkrivTSorisebis manZili diddeba, xolo mwkrivebSi mcenareebi ganlagebulia punqtirulad 23-27 sm daSorebiT. Tesvis es wesi sarevelebis winaaRmd eg brZolis met saSualebas iZleva, ukeTesi pirobebi iqmneba kulturul mcenareTa zrdaganviTarebisaTvis, advildeba naTesis movla, TiTqmis iTiSeba agroteqnikuri samuSaoebidan gamoxSirvis aucilebloba da diddeba Sromis nayofiereba. Tu farTomwkrivebSi Tesvis dros mcenareebi erTmaneTisagan Tanabari manZiliT aris d aS o r ebul i maS i n am wess **kvadratulad** T esva ewo d eba.

**budobrivi** Tesva igive mwkrivad Tesvaa, im gansxvavebiT, rom iTeseba jguf-j guf ad

er T wer t i l S i (bud naS i ) 2-d an 7-8 c al amd e.

Tu budnebi erTimeoresagan orive mimarTulebiT Tanabari manZiliTaa daSorebuli, mas kvad r at ul -bud o br i vad T es va ewo d eba.

**Teslbrunva, mi s i SemoReba d a aT vi seba.**

sasoflo sameurneo kulturebisa da aneulebis mecnierulad dasabuTebul morigeobas drosa da sivrceSi (mindvrebze) Teslbrunva ewodeba. misi ZiriTadi amocanebia: niadagis nayofierebis gadideba da kvebis elementebis racionaluri gamoyeneba, mosavlis gazrda da memcenareobis produqciis xarisxis amaRleba, mindvrebis dasarevlianebisa da mcenareebis mavneblebiTa da daavadebebiT dazianebis S emc i r eba. qar i s mi er i d a wyl i s mi er i er o z i i s agan uar yo f i T i gavl eni s T avi d an ac i l eba.

Teslbrunvis ekonomikuri safuZvelia saTesi farTobebis mecnierulad dasabuTebuli struqtura (sxvadasxva sasoflo-sameurneo kulturebisa da sufTa aneulebis farTobebis Sefardeba procentebSi saxnavi farTobis mimarT), romelic uzrunvelyofs produqciis maqsimalur gamosavals farTobis erTeulidan umciresi TviTRirebulebiT. saTesi farTobebis struqturas amuSaveben uSualod meurneobaSi ganviTarebis perspeqtiuli gegmis safuZvelze, niadagur-klimaturi pirobebis gaT val i s wi nebi T .

s as o f l o -sameurneo kulturebisa da aneulebis droSi morigeobiT CamonaTvals T es l br unvi s s qemas uwo d eben.

Cveulebriv Teslbrunvis TiToeul mindorze iTeseba TiTo kultura, rac rTuli sasoflo-sameurneo teqnikisa da progresuli agroteqnikuri wesebis gamoyenebis SesaZleblobas iZleva, magram umetesad mokle rotaciis zogierT TeslbrunvaSi. zogjer erT mindorze iTeseba ori garemo pirobebisadmi erTnairi moTxovnilebis da agroteqnikis msgavsi kultura. mindors, romelzedac iTeseba ori da meti kultura S ed geni l s , anu nakr eb mi nd o r s uwo d eben.

U esa Tu is kultura, xangrZlivi periodis ganmavlobaSi moiyvaneba erTi da imave mindorze, mas uwodeben ucvlel kulturas, Tu es kultura meurneobaSi erTaderTia- mo no kul t ur as uwodeben. erT da imave mindorze araumetes rva wlis ganmavlobaSi z ed i z ed mo sayvan kul t ur as ganmeo r ebi T kul t ur as uwo d eben.

cneba **Teslbrunvis gareSe** mindori, niSnavs TeslbrunvaSi Caur T av mi nd o r s ,

romelzedac moiyvaneba sasoflo - sameurneo kulturebi, xolo **gamoyofili mindori** – romelic droebiT gamoyofilia kulturaTa saerTo morigeobidan da dakavebulia ramdenime wels erTi da igive kulturiT. yvelaze xSirad gamoyofil mindorze mohyavT i o nj a, espar c et i d a s xva.

ramdenadac mecnierebiTa da praqtikiT damtkicebulia kulturaTa zedized Tesvis uaryofiTi Sedegebi, Teslbrunvis aucilebel moTxovnas warmoadgens maTi morigeoba, periods, romlis ganmavlobaSi kulturebi da aneulebi gaivlian morigeobas yovel mi nd o r z e T es l br unvi s s qemi T gaT val i s wi nebul i T anmi md evr o bi T , **Teslbrunvis rotacia** ewodeba, xolo kulturaTa da aneulis gaadgilebis gegmas mindvrebisa da wlebis mixedviT mocemul periodSi- **sarotacio cxrili**. yovel mindors eZleva mudmivi nomeri, r o mel i c r ukas a d a kar t o gr amaz e gamo i xat eba r o maul i c i f r ebi T .

**kul t ur aT a mo r i geo bi s mec ni er ul i saf uZvl ebi**

akad. prianiSnikovma gamoyo oTxi umTavresi mizezi, rac iwvevs sasoflo-s ameur neo

kulturebis mosavlis amaRlebas maTi Teslbrunvis swori morigeobis dros. qimiuri, f i z i kur i , bi o l o gi ur i d a eko no mi kur i .

**qimiuri mizezebi**. sxvadasxva mcenare sxvadasxva odenobis sakveb nivTierebebs moiTxovs. zogierTs, magaliTad marcvlovanebs meti azoti da fosfori esaWiroebaT, sxvebs ki (magaliTad kartofils, Saqris Warxals, boWkovan kulturebs)-SedarebiT meti kaliumi, iseTi mcenareebi, rogorebicaa parkosani balaxebi, barda, lobio da sxva samarcvle parkosnebi, iTviseben bevr kaliumsa da fosfors, imave dros fesurebze ganviTarebuli koJris baqteriebis saSualebiT haeridan afiqsireben da amdidreben ni ad ags az o t i T .

marcvleuli kulturebis morigeoba saToxnebTan da parkosnebTan gamoricxavs niadagis calmxriv gaRaribebas sakvebi nivTierebebiT. normaluri mosavlis dros erTwliani parkosani kulturebi (lobio, barda, cercvela) niadagSi agroveben 50-70 kg ha-ze met azots, xolo mravalwliani parkosani balaxebi (ionja, samyura, esparceti) 120-150 kg d a met s . mcenareebi sakvebi nivTierebebis SeTvisebis sxvadasxva unarianobiT xasiaTdebian. am unarianobas isini avlenen fesvebis masis sididiT da sakvebi nivTierebebis advilad d a Znel ad xs nad S enaer T ebT an d amo ki d ebul ebi T .

kulturaTa morigeoba aucilebelia im TvalsazrisiTac, rom niadagidan gamotanili sakvebi nivTierebebi, sxvadasxva kulturis mier sxvadasxvanairia da d amo ki d ebul i a sanawver al o anar Cenebi s r ao d eno baz e. yvel az e met s anawver al o anar Cens iZleva mravalwliani parkosani da marcvlovani balaxebi, saSualos-mar c vl o vani kul t ur ebi d a yvel az e mc i r es -kar t o f i l i d a S aqr i s War xal i .

amis gaTvaliswinebiT kulturaTa morigeobis umniSvnelovanesi mizezia fesvebis araerTnairi CaRweva niadagSi. selisa da kartofilis fesvebi Cadian 0,8-1,0 m siRrmeze, saSemodgomo xorblisa da Wvavisa- 1,5-1,6 m-ze, simindisa-2,0-2,5 m siRrmeze, aqedan gamomdinare, fesvebis mZlavrad da Rrmad mimavali mcenare iTvisebs wylisa da mineraluri kvebis elementebs niadagis ufro Rrma fenidan, rac sust fesvebian mc enar eebs ar S euZl i aT .

e.i.TeslbrunvaSi kulturaTa swori morigeoba saSualebas iZleva aramarto T avi d an avi c i l o T ni ad agi s c al mxr i vi gaR ar i beba, ar amed ef eqt i anad gamo vi yeno T kvebi s el ement ebi s mar agi .

**fizikuri mizezebi.** TeslbrunvaSi kulturaTa swori morigeoba xelSemwyobad moqmedebs niadagis struqturaze, saxnavi fenis sifxviereze, mis haerovan da wylis reJimze, niadagis simtkiceze da mocemuli fenis Senebaze. amasTan, gansakuTrebuli mni S vnel o ba aqvT mr aval wl i an bal axebs mz es umz i r a, S aqr i s War xal i , s ud anur as bal axi Zlierad aSroben niadags. amitom, maT Semdeg ar SeiZleba moTavsdes wylisadmi gad i d ebul i mo T xo vni s mqo ne kul t ur ebi .

ZiriTadi mindvris kulturebi klebadi unarianobiT SeiZleba ganlagdes Semdegi rigiT: mravalwliani balaxebi-er T wl i an parkosan-marcvlovanTa narevebisaSemodgomoebi-simindi-sagaz af xul o mar c vl o vnebi , kar t o f i l i d a Zi r xvenebi .

**biologiuri mizezebi.** kulturaTa morigeoba sxvadasxvanairad moqmedebs sarevelebis, mavneblebisa da daavadebebis ganviTarebaze. amitom, morigeobis dawesebi T

SesaZlebelia mizanmimarTulad daigegmos maTTan brZolis strategia. farTofoTlovani, maRalReroiani (simindi, mzesumzira) Crdilavs ra niadags, Zlier Trgunavs sarevelebs, vidre viwrofoTlovani (Svria, qeri, fetvi), xolo swrafmozardi saSemodgomo Wvavi da xorbali-advilad, vidre sagazafxulo xorbali da fetvi. s aT o xnebi s mwkr i vT S o r i s ebi s d amuS avebi T mo yvani sas , s ar evel aT a ganad gur ebi s pi r o bebi umjobesdeba marcvleulisa da sxva kulturebis mTlian naTesebTan SedarebiT. sarevelebTan brZola advilia, Tu sworad aris dagegmili saSemodgomo da sagazafxulo kulturebis morigeoba. marcvleulisa saToxnebTan an samarcvle parkosnebTan, viwrofoTlianisa-farTofoTlianTan. yvelaze metad sarevlebi nad gur d eba s uf T a aneul z e.

kulturaTa ganmeorebiTi da zedized Tesvisas xelSemwyobi pirobebi iqmneba

mavneblebis gasavrceleblad. magaliTad, Saqris Warxalze gaZlierebulad viTardeba Warxlis cxvirgrZela, fesvis tili da nematodebi, parkosan kulturebze koJrebis cxvirgrZelebi.

saSemodgomo xorblis zedized Tesvisas swrafi gavrcelebis pirobebi eqneba puris bzualas, xorblis mxerxavas, mavneblebisagan miyenebuli zarali mniSvnelovnad mc i r d eba kul t ur aT a mi z anS ewo ni l i mo r i geo bi T .

marcvleuli kulturebis infeqciur daavadebaTa Soris gavrcelebiTa da dazianebiT pirvel adgils ikavebs fesvis sidampleebi, isini viTardebian mcenaris miwisqveSa da miwispira organoebze. ris Sedegad mcirdeba normalurad funqcionirebadi fesvebi, irRveva mcenaris kavSiri niadagTan, mkveTrad mcirdeba mcenaris wyalmomarageba da TavTavis kveba. mcirdeba an mTlianad ikargeba mcenareTa produqtiul o ba. uar es d eba mo savl i s xar i s xi .

**ekonomikuri mizezebi.** kulturaTa morigeoba mizanSewonilia Sromisa da teqnikuri

saSualebebis racionaluri gamoyenebis TvalsazrisiTac. amasTan masSi unda iyos sxvadasxva vadaSi dasaTesi da asaRebi kulturebi da jiSebi. es ki uzrunvelyofs mindvris samuSaos optimalur vadebSi da maRali xarisxiT Catarebas, minimaluri d anaxar j ebi T maqs i mal ur ad s t abi l ur i mo s avl i s mi R ebas .

ekonomikurad xelsayrelia Teslbrunvebis daspecialeba-maTSi maqsimalurad unda gadi d d es wamyvani kulturebis wili. aseT TeslbrunvebSi marcvlovan kulturebs S ei Zl eba ekavo s f ar T o bi s 50-60%. T es l br unvebi s s pec i al i z ac i a amaR l ebs memc enar eo bi s produqciis warmoebas, zrdis kapital dabandebaTa efeqtianobas, amcirebs SromiT da mat er i al ur d anaxar j ebs .

## Zi r i T ad kul t ur aT a wi namo r bed ebi

sasoflo-sameurneo kulturas an aneuls, romelTac ukaviaT mocemuli mindori wina

wels, winamorbedebi ewodebaT. aneuli ki garkveuli periodis ganmavlobaSi sasoflosameurneo kulturis moyvanisagan Tavisufal mindors (yuradRebiT damuSavebuli, gano yi er ebul i d a sar evel ebi sagan T avi s uf al i ).

aneulebi da sasoflo-sameurneo kulturebi, maTi moyvanis wesebi mniSvlelovan gavlenas axdenen niadagis Tvisebebze, rac arsebiTad aisaxeba momdevno kulturaTa mosavlianobaze. am gavlenis xarisxis mixedviT yvela winamorbeds iyo f a s aukeT es o d , kargad, damakmayofileblad da aerTianeben Semdeg jgufebSi: 1 sufTa da dakavebuli aneulebi; 2. mravalwliani balaxebi; 3. samarcvle parkosnebi; 4. saToxnebi; 5. teqnikuri ar asaT o xnebi ; 6. s aS emo d go mo mar c vl o vnebi ; 7. sagaz af xul o mar c vl o vnebi ; 8. erTwliani bal axebi .

## Sual ed ur i kul t ur ebi T es l br unvaSi

Sualeduri kulturebi ewodeba im kulturebs, romlebic moiyvaneba TeslbrunvaSi ZiriTadi naTesebisagan Tavisufal periodSi. maT ZiriTadad iyeneben cxovelebis s akvebad mwvane s akvebi , senaJ i , s i l o s i , bal axi s f qvi l i , agr eT ve r o go r c mwvane sas uqi ).

S ual ed ur i naT es ebi mi waT mo qmed ebi s i nt ens i f i kac i i s umni Svnel o vanes i Ff aqt o r i a. i s i ni s aSual ebas i Zl evi an s r ul ad i qnes gamo yenebul i mi wa. ad i d eben sakvebi s war mo ebas da aumjobeseben maT xarisxs. es kulturebi asruleben sanitarul rols sasoflosameurneo kulturebis sarevelebTan, avadmyofobebTan da mavneblebTan brZolaSi, riTac asusteben kulturaTa maRali koncentraciis araxelSemwyob Semdgom moqmedebas specializirebul TeslbrunvaSi. niadags amdidreben organuli nivTierebebiT, xolo parkosnebi azotiTac, icaven niadags wylismieri da qarismieri eroziisagan. aumjobeseben mis struqturas da mTlianad xels uwyoben nayofierebis amaRlebas. sarwyav miwaTmoqmedebaSi isini amcireben niadagis damlaSebas. swrafad mozardi Sualeduri kulturebi uzrunvelyofen ra ReroTa xSir dogmas, arsebiTad Trgunaven s ar evel ebs .

yvel a S ual ed ur i kul t ur a mo vl a-mo yvani s a d a vad i s mi xed vi T i yo f a s agaz af xul o ,

sanawveralo, s aS emo d go mo d a mo z amT r e Sual ed ur kul t ur ebad ..

**saSemodgomo Sualeduri kulturebi** iTeseba zafxulis bolos safarqveS. an ZiriTadi kulturis Semdeg da aiReba gazafxulze. maTi aRebis Semdeg iTeseba Teslbrunvis ZiriTadi kultura. aseT kulturebad mohyavT saSemodgomo Wvavi, saSemodgomo xorbali tritikale, saSemodgomo qeri, mozamTre Svria, saSemodgomo cercvela, mozamTre barda, saSemodgomo rafsi, isini gvaZleven yvelaze adreul mwvane masas d a ar sebi T ad avs eben s akvebi s d ef i c i t s am vad aS i .

**sanawveralo Sualedur** kulturebad iwodeba ZiriTadi kulturis aRebis Semdeg naTesi kulturebi zafxul Semodgomis darCenili savegetacio periodis gamosayeneblad. maTTvis saWiroa sul cota 65-70 uyinvo dRe, aqtiur temperaturaTa jami aranakleb 10000°C da naleqebi (urwyavebSi) aranakleb 100 mm-isa. am mxriv gansakuTrebuli reputaciiT sargeblobs: simimdi, mzesumzira, erTwliani balaxebi, r af s i d a s xva s wr af ad mo z ar d i kul t ur ebi .

**saganaTibo kulturebi**. saganaTibo Sualeduri naTesebi ewodeba ZiriTadi kulturis mwvane sakvebad, senaJad, silosad an Tivad aRebis Semdeg imave wels naTes kulturebs (saSemodgomo Wvavis, erTwliani kulturebis Semdeg da sxva naTesebs). sanawveralo naTesebisgan isini gamoirCevian ufro adreul periodSi TesviT. s aganaT i bo kul t ur ebad Zi r i T ad ad i yeneben i gi ve s anawver al o s aT es kul t ur ebs .

SesaTesi Sualeduri kulturebi iTeseba gazafxulze ZiriTadi kulturebis safarqveS. am mizniT iyeneben: Citifexas, saSemodgomo da sagazafxulo cercvelas, er T wl i an ko i nd ar s , bar d as , xanWko l as , s amyur as , es par c et s , Zi Zo sa d a s xva.

## T es l br unvebi s kl as i f i kac i a

Teslbrunvebis mravalferovneba kulturaTa Semadgenlobis, morigeobis, mindorTa r ao d eno bi s d a s xva ni S nebi T c al c al ke j guf ebad i yo fa.

**Teslbrunvis tipebi** Tanamedrove klasifikaciiT gamoyofilia Teslbrunvebis sami tipi: mindvris, sakvebi da specialuri. am dayofis safuZvlad aRebulia mocemul T es l br unvaS i war mo d geni l i Zi r i T ad i pr o d uqc i i s saxe.

**mindvris Teslbrunvebi** . mindvris Teslbrunvebs miekuTvneba iseTi Teslbrunvebi, romlebic gaTvaliswinebulia marcvlisa da teqnikuri kulturebis sawarmoeblad. mindvris Teslbrunvis mcire nawili SeiZleba dakavebul iyos agreTve sakvebi balaxebiT.

**sakvebi Teslbrunvebi** aris iseTi Teslbrunvebi, romlebic gaTvalis wi nebul i a

sakvebis sawarmoeblad. sakvebi kulturebis ama Tu im jgufebis siWarbeze damokidebulebiT sakvebi Teslbrunvebi iyofa saTib-saZovris da fermispira Teslbrunvebad. saTib saZovrebian TeslbrunvaSi Warbobs sxvadasxva mizniT gamosayenebeli mravalwliani balaxebi, xolo fermispiraSi-sasilose kulturebi, Zi r xvenebi d a bal axebi -mwvane sakvebad .

**specialuri Teslbrunvebi** gamoiyeneba erTi an ramdenime Zvirfasi kulturis mosayvanad, romlebic gansakuTrebulad nayofier niadagebs moiTxoven. magaliTad, bo s t neul i kul t ur ebi, Tambaqo da sxva. brinji saWiroebs moyvanis specialur pirobebs s i c o c xl i s pi r vel per i o d S i d a S es abami si hi d r o t eqni kur i qsel i s mo wyo bas .

^**Teslbrunvis saxeebi.** miwaTmoqmedebis daspecialebaze damokidebulebiT mindvris Teslbrunvebi specializdebian kulturebis mcire jgufis movla moyvanaze. 1-2 damxmare kulturis gaTvaliswinebiT, magram mindvrisa da sakvebis specializirebuli Teslbrunvebi, romlebic gaadgilebulia Cveulebriv mindvrebze, ar SeiZleba s pec i al ur ebT an gai gi vd es.

TiToeuli am jgufis (tipis) Teslbrunvebi iyofa saxeebad, am dayofis safuZvlad aRebulia mosayvani kulturebis urTierTSefardeba teqnologiis Taviseburebebisa da niadagis nayofierebis mixedviT, agreTve sufTa aneulis monawileoba masSi da misi xved r i T i wi l i . s ul gamo yo f en T es l br unvebi s c xr a saxes :

m a r c v l o v a n a n e u l i a n i T e s l b r u n v e b i– T es l br unva,

romelSic marcvleulis naTesebTan morigeobs sufTa aneuli da marcvleuli kulturebi ikaveben Teslbrunvis umetes nawils. yvelaze tipiuria morigeoba: 1 sufTa aneuli.

2 . saSemodgomo xorbali, 3. saSemodgomo xorbali, 4. qeri. aseTi Teslbrunva r eko mend ebul i a gval vi an r ai o nebS i .

m a r c v l o v a n a n e u l i a n i s a T o x n i a n i T e s l b r u n v a aris iseTi morigeoba, romelSic marcvlovani kulturebi icvleba sufTa aneuliT da saToxni kulturiT, marcvlovani kulturebi ki TeslbrunvaSi ikaveben misi farTobis 50%-ze mets.

s i d e r a l u r T e s l b r u n v a S i erTi an or mindorze moiyvaneba

s as i d er ac i o kul t ur aT a (magal i T ad , xanWko l a an bar d a) mwvane sas uqad Casaxnavad m a r c v l o v a n- b a l x o v a n T e s l b r u n v a S i farTobis umetesi nawili ukavia marcvlovan da ara saToxn teqnikur kulturebs, xolo danarCeni f ar T o bebi d akavebul i aqvs mr aval wl i an bal axebs .

b a l x o v a n T e s l b r u n v a S i farTobis naxevarze meti eT mo ba

mravalwlian balaxebs. danarCen farTobs ikavebs marcvleuli kulturebi. erTwliani bal axebi , t eqni kur i kul t ur ebi .

b a l x o v a n s a T o x n i a n T e s l b r u n v a S i saToxni kulturebis

mi nd vr ebs enac vl eba mr aval wl i ani bal axebi , r o ml ebi c i kaveben o r an met mi nd o r s .

m a r c v l o v a n- b a l x o v a n , s a T o x n i a n an n a y o f c v l i T T e s l b r u n v a S i farTobis naxevarze naklebi eTmoba marcvlovan kulturebs, xolo farTobis meore naxevarze moiyvaneba saToxni da parkosani kulturebi (r o go r c wesi, unda iyos kulturaTa yovelwliuri cvla), aseT TeslbrunvaSi arc erTi kul t ur a ar i T es eba o r wel i wad s z ed i z ed .

m a r c v l o v a n s a T o x n i a n T e s l b r u n v a-Teslbrunva, sadac marcvlovnebis naTesebi icvleba saToxni kulturebiT da marcvlovnebs ukaviaT f ar T o bi s naxevar z e meti.

s a T o x n i T e s l b r u n v a – T es l br unva, sad ac s aT o xni kul t ur ebi s aT vi s

gamoyofilia naxevarze meti farTobi, sufTa aneulebi am TeslbrunvaSi ar aris, xolo saToxnebi iTeseba ganmeorebiT an sxva saToxnebis Semdeg:L1. simindi sasilosed

2. saSemodgomo xorbali, 3. Saqris Warxali, 4. simindi 5. saSemodgomo xorbali 6. mzesumzira, 7. saSemodgomo xorbali, 8. Saqris Warxali, 9. simindi, 10. saSemodgomo xorbali.

warmodgenil TeslbrunvaSi umTavresad klasificirebulia sxvadasxva kulturis urTierT Sefardeba miRebuli morigeobiT da niadagis nayofierebis mixedviT. magram amasTan Teslbrunvis kalasifikaciis dros iTvaliswineben mindvrebis raodenobas da Teslbrunvis mimarTulebas. magaliTad, zemoT moyvanili saToxni Teslbrunva yvela miTiTebuli niSniT, unda daxasiaTdes rogorc: mi nd vr i s , aT mi nd vr i ani , s aT o xni . miwaTmoqmedebis saToxniani sistemis, simind Warxlis mimarTulebis. TiToeul T es l br unvas S ei Zl eba mi ec es anal o gi ur i d axas i aT eba.

TiToeuli Teslbrunva Sesdgeba calkeuli rgolebisagan, isini warmoadgenen Teslbrunvis nawils, romlebic Seicaven or sam sxvadasxva kulturas, aneulis CaTvliT. calkeuli rgolebidan Sei Zl eba Sedges Teslbrunva datvirTul i sxvadasxvanairad, marcvlovani kulturebiT an saToxni kulturebiT, TiToeuli kulturis ama Tu im SefardebiT. rgols, rogorc wesi, iwyeben saukeTeso da kargi war mo mad genl o bi T .

s a k v e b i T e s l b r u n v e b i umetes SemTxvevaSi gaTvaliswinebulia wvniani da uxeSi sakvebis sawarmoeblad, arCeven fermispira da saTib saZovriani T es l br unvebs .

f e r m i s p i r a Teslbrunva gaTvaliswinebulia wvniani da mwvane sakvebis sawarmoeblad. Seicavs marcvlovan-bal axo van-saToxnian (nayofcvliTi ), saToxn da balaxovan-s aT o xni an T es l br unvebs . mi nd vr ebs , r o go r c wes i , aT avs eben f er mebi s axl o s .

s a T i b s a Z o v r i a n i Teslbrunva Seicavs balax mindvrian (maT Soris niadagdamcav) Teslbrunvebs. farTobis didnawils iyeneben mravalwliani balaxebis qveS.

s p e c i a l u r i T e s l b r u n v e b i gaTvaliswi nebul i a

kulturebisaTvis, romebic movla-moyvanisaTvis moiTxoven specialur agroteqnikas. specialur TeslbrunvebSi Sedian marcvlovan- balaxovani (maTSoris brinj i ani ), balaxovan saToxniani (maT S o r i s bostneulis, baRCeulis, Tambaqoiani da sxva) niadagdamcavi Teslbrunvebi. niadagdamcav TeslbrunvebSi sasoflo-s ameur neo kul t ur aT a nakr ebi s gaad gi l eba d a mo r i geo ba i c avs ni ad ags er o z i i sagan.

meurneobaSi, rogorc wesi, racionalurad unda SeeTanawyos s xvad as xva t i pi s Teslbrunvebi (mindvris, sakvebi, specialuri). am SeTanawyobas miwaTmoqmedebaSi T es l br unvaT a s i s t emas uwo d eben.

## T es l br unvebi s Semo R eba d a aT vi s eba

Teslbrunvis SemoReba aris Teslbrunvis damuSavebuli proeqtis teritoriaze nat ur aS i gad at ana. proeqtis Semdeg atareben samiwaTmowyobo samuSaoebs: hyofen Teslbrunvebs da

mi nd vr ebs nat ur aS i .

mindvrebi SesaZleblobis mixedviT unda iyos sworkuTxovani an masTan axlo gzisken gamosasvleliT. vake, velian da tye velian raionebSi maT grZeli mxareebiT aadgileben gabatonebuli qarebis perpendikularulad, ferdobze-per pend i kul ar ul i mimarTulebiT an horizontalebze. dauSvebelia, rom mindvrebi hkveTdnen gzebs, mdinareebs, Releebs, xevebs, tyes. sasurvelia, mindvrebis sazRvrebs bunebriv sazRvrebTan damTxveva (gza, mdinare da sxva). am RonisZiebebiT mTavrdeba T es l br unvebi s Semo R ebi s per i o d i .

Teslbrunvis yovel mindorze Cveulebriv Tesaven erT kulturas, rac gvaZlevs saSualebas gamoyenebul iqnes teqnika, sasoflo-sameurneo kulturebis movla-mo yvani s intensiuri teqnologia. nakrebi (Sedgenili) mindvrebis raodenoba minimumamde unda S emc i r d es .

amrigad, meurneobis teritoriis swori organizacii s da Teslbrunvebis SemoReba saSualebas iZleva ufro produqtiulad iqnes gamoyenebuli aramarto TeslbrunvaSi CarTuli miwebi, aramed sxva savargulebic (bunebrivi mdeloebi, saZovrebi). Teslbrunvebis damuSavebisas, mxedvelobaSi iReben maT Sedgenilobas da Sefardebas, rom gegmiuri davalebis garda, uzrunvelyofili iqnes samuSao Zalisa da saSualebebis umciresi danaxarjebi. SemoRebulad iTvleba Teslbrunva, roca misi proeqti gad at ani l i a meur neo bi s mi waT sar gebl o bi s t er i t o r i az e.

**Teslbrunvis aTvisebaSi igulisxmeba** Teslbrunvis gegmis Sesruleba da sasoflosameurneo kulturebis sqemis da winamorbedebis mixedviT ganlageba. es periodi gr Zel d eba 2-3 wel i wad s . mr aval wl i ani bal axebi s gar eS e ki er T i o r i wel i .

kulturaTa gaadgilebisas gardamaval periodSi miiswrafvian iqiTken, rom mindorze moTavsdes erTi kultura. Tu es SeuZlebelia-araumetes erTmaneTis msgavsi ori kultura (gasToxni, saburRule, sakvebi, marcvlovani). Teslbrunvis aTvisebis per i o d S i ad genen gar d amaval c xr i l s (kul t ur aT a gaad gi l ebi s s qema).

swor Teslbrunvaze gadasvlis dros asruleben Semdeg moTxovnebs: iReben yvela kulturis gegmur mosavals, racionalurad iyeneben miwas, kulturebs alageben ukeTes winamorbedebze da qmnian xelSemwyob pirobebs, mecxoveleobisaTvis iReben dagegmili r ao d eno bi s maRal xar i sxo van sakvebs , awyo ben S r o mi s s wo r o r gani z ac i as .

swori Teslbrunvebi SesaZleblobas iZleva yvelaze ufro racionalurad gamoviyenoT niadagis kvebis elementebi da sasuqebi, gaadgildes sarevelebTan, mavnebl ebT an, daavadebebTan da daavadebis gamomwvevebTan brZola. ufro produqtiulad daixarjos niadagis tennis maragi, Tanabrad ganawildes yvela mindvris samuSao, mwarmoeblurad iqnes gamoyenebuli teqnika, efeqtianad dainergos warmoebaSi mec ni er ebi s mi R wevebi d a mo wi naveT a gamo c d i l eba.

sameurneo praqtikaSi SesaZlebelia gadaxra kulturaTa miRebuli morigeobidan

(magaliTad, saSemodgomo naTesebis an mravalwliani balaxebis daRupvisas). am SemTxvevaSi Secvlas akeTeben ise, rom ar dairRves rotacia: mravalwliani balaxebi- er T wl i ani par ko s nebi T , s aS emo d go mo xo r bali-S vr i i T d a a.S . aseT i c vl i l ebebi , r a T qma und a, gad axvevaaa T es l br unvi d an, magr am ar S ei Zl eba d ar R vevad Cai T val o s , i s i ni S eaqvT r o t ac i i s c xr i l S i d a i T val i s wi neben agr o t eqni kur R o ni s Zi ebebs mo maval i wl i s aT vi s . saqarTvelos marcvleulis mwarmoebel gvalvian (kaxeTi, qarTli) raionebSi arasaaneulo winamorbedebis Semdeg, Zalian mSrali Semodgomis pirobebSi saSemodgomoebi zogjer ar iZlevian normalur aRmonacens. zogjer ukeTesia arc daiTesos mocemul wels da gadatanil iqnes gazafxulisaTvis. magaliTad, sagazafxulo xorblis dasaTesad. xelSemwyob pirobebSi SesaZlebelia gafarTovdes saSemodgomo pureulis naTesebi sagazafxulo marcvleulis xarjze, rac xels uwyobs meti marcvleulis miRebas Teslbrunvis farTobidan. aseT movlenas aseve ar Tvlian d ar R vevad .

**Teslbrunvis mindvris istoria da agropasporti** Teslbrunvis mindvrebis istoriis wi gni umni S vnel o vanes i d o kument i a, r o mel S i c as axul i a T i T o eul i mi nd vr i s i s t o r i a d a miwaTmoqmedebis kulturis arsebuli done. masSi yvela Canaweri keTdeba pirveladi Canawer ebi s s af uZvel z e.

mindvrebis istoriis wigni srulyofili matianea imisi Tu mocemul mindorze ra samuSaoebi, rogor da rodis aris Catarebuli, rogori Sedegebia miRebuli, maTgan Tavisuflad SeiZleba ganisazRvros Catarebuli agroteqnikuri da sxva RonisZi ebebi s eko no mi kur i ef eqt i ano ba saxnavi mwebi s er o z i i s agan d ac vi s agr o t eqni kur i saf uZvl ebi

**ni ad agi s er o z i a.**

niadagis erozia ewodeba misi zedapiruli yvelaze nayofieri fenisa da misi qveda qanebis daSlis process nadnobi da naleqebis wylebiT (wylismieri erozia) an qaris ZaliT (qarismieri erozia) eroziis Sedegad daSlil niadagebs erodirebuls uwodeben, bunebrivi mcenareulobis mier 1,5 sm-is daSlili humusovani fenis aRsadgenad saWiroa 100-150 weliwadi. amitom damuSavebaSi myofi miwebi mudmiv gaumjobesebasa da dacvas moiTxoven. winaaRmdeg SemTxvevaSi isini kargaven nayofierebas. eroziuli procesebi warmoiqmneba da mimdinareobs miwis araswori eqspluataciis , agroteqnikis Sablonuri gamo yenebi s , nad no bi d a nal eqebi s wyl i s ar ar egul i r ebi T , t yi s nar gao bi s d auc vel o bi T , mindorsacavi tyis zolebis araswori gaadgilebiT. igi Slis sasoflo-s ameur neo warmoebis umTavres saSualebas, ferdobi adgilebidan (20 da meti). nadnob da Camonaden wylebTan erTad yovelwliurad mindvrebis yoveli heqtaridan irecxeba 50-100 t-mde niadagi da 100-150 kg-mde sakvebi nivTierebebi**.** wylismier da qarismier eroziasTan sistematiuri brZola umniSvnelovanesi saerTo saxalxo saqmea. am brZolis saerTo war mat ebaz ea damokidebuli sasoflo-sameurneo savargulebis SenarCuneba da gaumjobeseba. niadagis nayofierebis amaRleba, mosavlianobisa da produqciis saerTo mo s avl i s z r d a ni ad agi s er o z i i s wi naaR md eg br Zo l a yvel a mo qal aqi s mo val eo baa.

niadagis eroziis yvela formas yofen Semdeg saxeebad:geologiuri erozia, anTropogenuri erozia, wylismieri erozia, wveTovani erozia, sibrtyiTi erozia, xazovani (siRrmiTi erozia), irigaciuli erozia, qarismieri erozia, mtvriani qariSxali, yoveldRiuri (ad gi l o br i vi ) er o z i a. sibrtyiTi eroziis dros, nadnobi da wvimis wylis wvrili nakadebiT xdeba niadagis SedarebiT Tanabari Camorecxva, e.i. zedapiri erodirdeba wylis Txeli feniT. es eroziis yvelaze gavrcelebuli da imave dros yvelaze naklebad SesamCnevi. sibrtyiTi erozia axarisxebs niadagis nawilakebs. tovebs ra yvelaze msxvilebs adgilze, miaqvs gamtverebuli wyalSi gajerebuli organuli humusovani nawili, romelTaganac yvelaze metad aris dakavSirebul i niadagis nayofiereba. xazovani (siRrmiTi) erozia sibrtyiTi eroziasagan gansxvavebiT niadags Slis siRrmeze. am saxis eroziasac iwveven nadnobi da naleqebis wylebi, romlebic meti daqanebis gamo Zlieri siswrafiT mieqanebian dablobisaken, Slian da angr even ra niadagsa da mis dedaqans, jer warmoqmnian mcire naRarebs da Txrilebs, romlebic TandaTan diddebian da gadadian xevebSi. xevebis warmoqmnas xels uwyobs agreTve adgilis uswormasworo reliefi da zogan adgilad Camorecxvadi niadagisa da qani s f i z i kur i T vi s ebebi.

irigaciuli erozia mimdinare da sarwyavi wylebiT niadagebi irecxebian. sarwyav wyals sistematiurad gamoaqvs mindvrebidan niadagis nawilakebi, risTvisac mas irigaciuli ewodeba. igi ZiriTadad warmoebs ara swori rwyvis Sedegad. qarismier erozias met naklebi raodenobiT, adgili aqvs TiTqmis yvelgan, gansakuTrebiT velian da gvalvian miwaTmoqmedebis pirobebSi. mtvriani qariSxali qarismieri eroziis saxea. am dros niadagi iSleba da deflacias ganicdis. qars niadagis humusovan fenasTan erTad miaqvs kulturaTa da sarevela mcenareTa Teslebi da aRmonaceni. am saxis erozias gansakuTrebiT didi ziani moaqvs, roca mindvrebi Zalzed gamomSralia da balaxebiT ar aris dafaruli. yo vel d R i ur i (adgilobrivi) erozia yoveldRiuri er o z i a, rogorc mtvris qariSxali Slis niadags da Rupavs kulturul mcenareTa naT es ebs . gans akuT r ebi T c ud i a ni ad agi s Zal i an wvr i l f r aqc i ad d aS l a d a s xva.

**ni ad agi s er o z i a da s as o f l o sameur neo kul t ur aT a mo saval i**

niadagis erozia sasoflo-sameurneo kulturaTa mosavals Zlier amcirebs. erodirebuli niadagebSi unda ganisazRvros niadagSi humusis raodenoba 0-50 sm siRrmeze, xolo kordian ewerian niadagebSi 0-30 sm siRrmeze. Tu humusis Semcveloba Semcirebulia 10-20%-iT, maSin is mi ekuT vneba sustad Camorecxilebs, 20-50 %-is SemTxvevaSi saSualo Camorecxilebs, xolo 50%- ze zeviT–Zlierad Camorecxilebs. erodirebuli niadagebis asaTviseblad saWiroa gamoyenebul iqnas organuli sasuqi azotian sasuqTan erTad specialurad dadgenili doziT. rogorc Cans, niadagis erodirebaze yvelaze metad reagirebs Saqris Warxali, mzesumzira, saSemodgomo xorbali, simindi da sxvebi. yvelaze naklebad reagirebs-Svria, saS. Wvavi da mravalwliani balaxi sustad erodirebul mi webze mosavali mcirdeba 5-10%-iT, s aS ual o Camo r ec xi l z e-15-40%-i T d a Zl i er Camo r ec xi l z e 25-55%-i T .

**ni ad agi s er o z i as T an br Zo l i s agr o no mi ul i s aSual ebebi**

wylismieri da qarismieri eroziasTan brZola, rogorc wesi, unda warmoebdes niadagdamcavi miwaTmoqmedebis gamoyenebiT. amisaTvis saWiroa am moTxovnis gaTvaliswineba Sida sameurneo miwaTmowyobis proeqtebSi. amasTan rogorc TeslbrunvaSi, ise Teslbrunvis gareSe farTobebze teritoriis eroziis sawinaaRmdego organizacia mdgomareobs im organizaciul-sameurneo kompleqsis, agronomiul, agrosatyeo-samelioracio RonisZiebebis gatarebaSi, romlebic xels uSlian wylisa da qarisagan niad agi s d aS l as , ar qmni an mi s i s awyi s pirobebs.

maRal niadagdamcav da ekonomikur efeqts uzrunvelyofs: mecnierulad dasabuTebuli Teslbrunvebi, niadagis damuSavebis, Tesvisa da naTesis movlis racionaluri wesebi, sasuqebis Setana, balaxebis Tesva, tyis zolebis gaSeneba, wylisa d a qarisadmi winaaRmdegobebis Seqmna (nawverlis datoveba, kulisebisa da mravalwlian nargavTa gaSeneba, Tovlis dnobis regulireba, sideratebisa da Sualeduri kul t ur ebi s mT es va, mZl avr ad ganvi T ar ebul i f es vT a s i s t emi s kul t ur ebi s mo yvana).

eroziasTan brZolaSi udidesi mniSvneloba aqvs agreTve niadagis eroziis

sawinaaRmdego damuSavebasac. daqanebis xarisxis, erodirebis donisa da sxva pirobebis mixedviT iyeneben daqanebis perpendikularul xvnas, niadagis konturul xvnas, Rrma ufrTo guTniT xvnas, niadagis gamaRrmavebliT xvnas, bazoebis SeqmniT xvnas, xvnas daRarviT, kombinirebul da safexurebian xvnas, dabudnebas da danapralebas, daRruebas da sxva.

## ni ad agi s wyl i s mi er i er o z i a d a masT an br Zo l a

ZiriTad bunebrivi faqtorebi, romelzedac damokidebulia er o z i a-klimati da reliefia.

wylismieri eroziis sawinaaRmdegod iyeneben-niadagis damuSavebis diferencirebul sistemas, konkretuli pirobebis- mosuli naleqebis, niadagis tipis, mindvris reliefis d a mc enar eul i saf ar i s gaT val i s wi nebi T .

Cveulebriv, damrec ferdobebze (1,0-1,50) mcired erodirebul miwebze niadags xnaven daqanebis gardigardmod, xolo rTuli reliefis pirobebSi horizontalebis mixedviT an nakveTs hyofen nawilebad da ToToeuli maTganisaTvis axorcieleben eroziis s awi naaR md ego xvnas d aqanebi s mi mar T ul ebi s a d a xar i s xi s S esabami s ad .

agroteqnikuri RonisZiebebi. eroziis sawinaaRmdegod agroteqnikur RonisZiebebs gansakuTrebuli mniSvneloba eniWeba, radaganac isini ufro xelmisawvdomia da SeiZleba Catardes sxvadasxva sasoflo-sameurneo samuSaoebTan erTad sistematiurad. eroziis sawinaaRmdego niadagis damuSavebis RonisZiebebSi Sedis: niadagis damuSaveba- niadagis eroziis winaaRmdeg didi mniSvneloba aqvs niadagis damuSavebis sworad SerCeul sistemas. moxvna- moxvna tardeba ferdobebze gardigardmo 25-27 sm siRrmeze. konturuli xvna xSirad tardeba sxvadasxva mxares daferdebul adgilebSi. erTad erTi misi gamoyenebis sirTules warmoadgens sagazafxulo Tesvis Semdeg ikargeba pirveladi konturebi da moiTxovs axal geodeziur gadaadgilebas momaval wels. ko nt ur ebi, rom ar daikargos amisaTvis saWiroa horizontalebis mixedviT aR ni S nul xazebze yoveli 100 metris Semdeg rekomendebulia daiTesos mravalwliani balaxebis z o l i (s aT es i s er T i mo d ebi s s i gani s ). es ki S ei Zl eba Cai T val o s s ai med o o r i ent i r ad .

niadagis zoluri gafxviereba. wylismieri eroziis ZiriTadi mizezi wylis balansis darRvevaa mosuli atmosferul naleqebsa da niadagis mier STanTqmul raodenobas Soris. yvelaze meti Camonadeni iq aris, sadac niadagis wyalgamtaroba ferdobze minimaluria. wyalgamtarobis gadidebis paralelurad wylis zedapirulad moZravi nakadi mcirdeba. am Taviseburebas yovelTvis iTvaliswineben ferdobi adgilebis xvnis wesis SerCevis dros 20 –mde daqanebis ferdobebze kokispiruli wvi mebi s Camonadenis dasakaveblad erTi Rrma xvna sakmarisi ar aris. am SemTxvevaSi d amat ebi T qmni an wyl i s d as akavebel mi kr o r el i ef s .

eroziis winaaRmdeg wylis dasakavebeli mikroreliefs warmoadgens: Txemebiani gardigardmo moxvna, safexurebiani da safexurebian Txemebiani xvna, niadagisa da aneulebis wyvetili daRarva, dabudneba, danapraleba da kvlebis gakeTeba. Txemebiani gardigardmo moxvna sruldeba Cveulebrivi guTniT, erTi frTis 40-40 sm-i T dagrZelebiT. aseTi frTa belts agdebs wina gavlilze da warmoqmnis 12-16 sm-i s simaRlis Txems (bazos), tovebs ra Ria kvlebs, bazoebi da kvlebi qmnian mniSvnelovan tevadobebs wylisaTvis. damuSaveba efeqturia erTmxrian daqanebul 50 –mde daxrilobis f er d o bebz e.safexurebiani da safexurebian-Txemebiani xvna tardeba sxvadasxva siRrmeze. aseTi wesiT xvnas atareben imitom, rom zedapiruli, dafaruli (xnulis Siga) Camonadeni. amisaTvis iyeneben Cveulebriv guTans ori gadidebuli dgariT, erTis gamoSvebiT. iqmneba kvlis safexurianoba, romelic akavebs niadagqveSa Camonadens. imisaTvis, rom ar moxdes naklebnayofieri fenis gadabruneba niadagis zedapi r z e, gagrZelebul dgarian korpusze ayeneben Semoklebul (SemoWril) frTebs. aseT xvnas uwodeben safexurebian-Txemovans, ramdenadac niadagis zedapiri xdeba Txemovani, warmoiqmneba kvlebi da bazoebi. aseT xvnas iyeneben martiv, erTmxriv daqanebul f er d o bebz e. ni ad agi sa d a aneul ebi s wyvet i l i d aRar vi saT vi s i yeneben kvl i s mwyvet ebs , wyvetil daRarvas akeTeben 5-100 daqanebis ferdobebze. dabudnaveba, danapraleba da daRruebas akeTeben specialuri iaraRebiT. niadagis danapralebis SemTxvevaSi 40-50 sm siRrmeze nadnobi wylis zedapiruli dinebis mniSvnelovani nawili gadahyavs niadagSiga fenaSi da amdidrebs qveda fenebs sakvebi elementebiT. amasTan is xels ar uSlis nakveTis Semdgom meqanizirebuli wesiT damuSavebas. aseTi wesiT damuSavebas i yeneben mr aval wl i an bal axebs a d a s aSemo d go mo kul t ur aT a naT es ebS i .

wylismieri eroziis sawinaaRmdegod arsebobs sxva mravali wesi da meTodi,

r o mel i c ko nkr et ul i pi r o bebi saT vi s und a S ei r Ces .

**qar i smi er i er o z i a d a mas T an br Zo l i s Ro ni s Zi ebebi**

qarismieri erozia, iseve rogorc wylismieri, did zians ayenebs soflis meurneobas,

gansakuTrebiT karbonatul Savmiwebs da wabla niadagebs, agreTve msubuqi S edgenilobis niadagebsa da sxva tipis niadagebs. qarismieri erozia saqarTveloSi ZiriTadad gvxvdeba zamTarSi. qarismieri eroziis sawinaaRmdegdD iyeneben niadagis damuSavebas brtylad mWreli tipis iaraRebiT. amasTan saWiroa niadagdamcavi Teslbrunvebis SemoReba.irigaciuli eroziis Taviseburebani irigaciuli erozia sarwyavi wylis mieraa gamowveuli. saqarTveloSi irigaciuli eropzia gvxvdeba ZiriTadad aRmosavleT saqarTveloSi, iq sadac sarwyavi sistemaa arasworada gamo yenebul i i r i gac i ul i er o z i i s mo saspo bad mi mar T aven S emd eg R o ni s Zi ebebs :

* s ar wyavi kvl ebi s d aWr as yvel az e mc i r e d axr i l o bi s mi xed vi T 10-12 s m s i R r mez e.
* 2-60 ferdobis daxrilobis, ferdobebze kvlebis sigrZe unda iyos 150-200 m-mde da mo r wyva war mo ebs 0,1-0,05 l /wm-S i .
* ferdobebze morwyva dawvimebiT unda warmoebdes. Camorecxil miwebze 25-40% -iT unda gadiddes mineraluri sasuqis dozebi. xolo organuli sasuqi Setanil unda iqnas 30-40 t/haze.

## c neba mi waT mo qmed ebi s s i s t emi s Ses axeb

xangrZlivi istoriuli ganviTarebis Sedegad Seiqmna miwaTmoqmedebis sistemebi. sazogadoebrivi cxovrebis ganviTarebis yovel etapze, isini arian agronomiuli mecnierebisa da praqtikis umaRlesi miRweva. miwaTmoqmedebis istoria uamr avi saukuneebs iTvlis da asaxavs sawarmoo Zalebis, sawarmoo urTierTobisa da kulturis ganviTarebis ama Tu im safexurs. adamianis miermiwaTsargeblobis esa Tu is wesi naTladvlindeba miwaTmoqmedebis sistemaSi. mindvris kultura yovelTvis, droTa ganmavlobaSi mecnieruli codnis dagrovebisa da praqtikuli gamocdilebis s af uZvel z e, ad ami ani s z emo qmed ebi T maRl d ebo d a d a s r ul yo f i l i xd ebo d a. miwaTmoqmedebis sistema samarTlianad iTvleba istoriul ekonomikur kategoriad. masS i mec ni er ul i d a pr aqt i kul i c o d na umaR l es kat ego r i amd ea ayvani l i .

a.v. sovetovis azriT, miwaTmoqmedebis sistemebi icvleba konkretuli bunebrivi faqtorebis, ekonomikuri pirobebisa, mecnierebisa da teqnikis ganviTarebaze d amo ki d ebul ebi T .

miwaTmoqmedebis sistema Tanamedrove gagebiT, aris agroteqnikuri melioraciuli da organizaciuli RonisZiebebis erTmaneTTan dakavSirebuli kompleqsi, mimarTulia miwis efeqturad gamoyenebis, niadagis nayofierebis SenarCunebisa da amaRlebis, sasoflo-s ameur neo kul t ur ebi s maRal i d a myar i mo s avl i s mi R ebi s aken.

miwaTmoqmedebis sistemis umTavresi niSania niadagis nayofierebis amaRlebisa da gamoyenebis wesi. niadagis gamoyenebis wesi xasiaTdeba miwis savargulebisa da naTesi farTobebis struqturis SefardebiT sasoflo-sameurneo kulturebis naTessa da saxnav farTobebTan, xolo niadagis nayofierebis efeqturi amaRlebis wesi-agr o t eqni kur R o ni s Zi ebaT a i nt ensi vo bi T .

**miwaTmoqmedebis sistemebi s war mo So ba d a s r ul yo f a**

istoriuli ganviTarebis periodSi icvleboda miwaTmoqmedebis sistemebic,

romlebic daiwyo primitiuli sistemidan, Semdeg eqstensiuri, gardamavali da gaxd a intensiuri.

**primitiuli sistemebi.** maT miekuTvneba axoian-cecxlovani, tyevelian-yamiriani da nasveniani sistemebi. am sistemis dros niadagis nayofierebis aRdgena xdeboda bunebr i vad ad ami ani s Car evi s gar eS e, r o mel s ac xangr Zl i vi d r o Wi r d ebo d a.

**axoian-cecxlovani sistema**. axali farTobebis asaTviseblad, am sistemis dros swvavdnen bunebriv tyis mcenareulobas, da maT ganT avi s uf l ebul farTobebze Tesavdnen sasoflo-sameurneo kulturebs. Tumca SedarebiT maRal mosavals pirvel wels iRebdnen, xolo Semdeg wlebSi niadagis nayofierebis Semcirebis gamo mo s aval i ano ba mc i r d ebo d a..

**tyeveliani sistema**. droebiT mitovebuli saxnavi miwebi tyed iqceoda, romelsac Cexavdnen, asufTavebdnen da saTesad iyenebdnen. ase TandaTanobiT axoian- cecxlovani s i s t ema t yemi nd vr i an s i s t emad gad ai qc a.

**yamiriani da nasveniani sistema.** velian raionebSi, Savmiwa, wabla niadagebze romelic balaxa mcenareulobiT iyo dakavebuli saxnavad iTvisebdnen. ramac xeli Seuwyo miwaTmoqmedebis yamiriani da nasveniani sistemis Camoyalibebas. magram aqac er T wl o vani kulturebis ganmeorebiT Tesvisas adgili hqonda maTi mosavalis TandaTanobiT Semcirebas. ris gamoc tovebdnen mindors da iTvisebdnen axal yamirs. nasvenad datovebul midvrebs 15-20 wlis Semdeg ubrundebodnen da amuSavebdnen s xvad as xva kul t ur ebi s d asaT es ad .

miwaTmoqmedebis primitiuli sistemebi damaxasiaTebelia feodalur wyobilebamde periodisaTvis. magram saqarTveloSi mas adgili hqonda me-19 saukunis bolomde. TviT me-20 s aukuni s sas awyi s S i c ki .

**miwaTmoqmedebis eqstensiuri sistemebi.** miwebis moxvnasTan erTad miwaT mo qmed ebi s pr i mi t i ul i s i s t emebi s ad gi l i nel nel a i kavebd a mar c vl o van-aneul i an s i s t ema. miwaTmoqmedebis marcvlovan-saaneulo sistema farTod iyo gavrcelebuli dasavleT evropaSi me-18 saukunemde, ruseTSi 1917 wlamde, saqarTveloSi TviT soflis meur neo bi s ko l eqt i vi z ac i amd e (1929-1930).

**miwaTmoqmedebis intensiuri sistemebi.** miwaTmoqmedebis intensiuri sistemisaTvis

tipiurad iTvleba inglisSi damuSavebuli norfouklis Teslbrunva: 1. samyura,

2. s aS emo d go mo , 3. s aT o xni , 4. sagaz af xul o S eT es vi T .

intensiuri miwaTmoqmedebis sistema gulisxmobs TiTqos yvela saxnav-saT es i

farTobebis da mrewvelobis mier miwodebul saSualebaTa gamoyenebas. intensiuri miwaTmoqmedebis sistemis - maRal safexurze miwaTmoqmedebis sistema farTovdeba da ufro kompleqsur xasiaTs Rebulobs: am sistemas ekuTvnis nayofcvliTi sistema, romelmac sawyisi miiRo XVI-XVIII saukuneebSi belgiasa da holandiaSi. nayofcvliTi sistemaze gadasvliT sufTa marcvleulis mimarTulebis meurneobebma adgili dauTmes mecxoveleobisa da teqnikuri kulturebis ganviTarebasac. gafarTovda samyuras da sxva sakvebi kulturebis Tesva. sistemis damaxasiaTebel niSnebs emateba niadagis ganoyierebis sistema, melioraciuli RonisZiebani, meTesleoba, agronomiuli mni S vnel o bi s t yi s z o l ebi , r wyvi s s i s t ema, mc enar eT a d aac vi s s i s t ema.

Tanamedrove intensiuri miwaTmoqmedebis sistemaSi xorcieldeba sasoflosameurneo samuSaoTa kompleqsuri meqanizacia da eleqtrifikacia, ris gamoc matulobs S r o mi s nayo f i er eba d a mc i r d eba pr o d uqc i i s er T eul z e d axar j ul i S r o mi s r ao d eno ba.

**mi waT mo qmed ebi s s i st emebi s i s t o r i ul i ganvi T ar ebi s sqema c xr . # 6**

(sasof l o sameur neo uni ver si t et i s mi waT moqmed ebi s kaT ed r a)

|  |  |  |
| --- | --- | --- |
| **s i s t emebi s j guf i** | **s i s t emebi s i nf r a st r uqt ur a** | **ni ad agi s nayo f i er ebaz e z emo qmed eba** |
| I-pr i mi t i ul i si st emebi | saxnavad vargisi miwebis mcire nawilia aTvisebuli (2025%-ze naklebi). saTesi farTobi saxnavze naklebia. warmoebis mimarTuleba-memcenareoba. mecxoveleoba Camoyal i bebul i a bunebr i v sakveb savar gul ebz e. | bunebr i vi f aqt or ebi |
| II-eqst ensi ur i si st emebi  (aneuliani, gaumjobesebul aneul i ani , mr aval mi ndvr ovan- bal axovani ) | saxnavad vargisi miwebis aTviseba ganuwyvetliv  mimdinareobs. iTeseba saxnavis 1/3.? an mecxoveleoba saz r d oobs rogorc bunebrivi sakvebi savargulebiT, aseve nawilobriv saxnavis xarjze. meurneobis calmxrivi memarcvleobis mimarTuleba TandaTanobiT mr aval d ar govnobi T i c vl eba. | bunebrivi faqtorebi da ad gi l obr i vi sasuqebi . |
| III-i nt ensi ur i si st emebi .  (naTes bal axi ani ,  nayof c vl i T i ) | saxnavi mTlianad aTvisebulia. saxnavi da saTesi farTobebi Tanatolia, zogan saTesi kidevac Warbobs saxnavs. mindvrad sakvebwarmoeba metnaklebad cvlis bunebrivi sakvebi savargulebis rols. isaxeba da viTardeba meur neobi s spec i al i z ac i a d a mr aval d ar govnobi s Sez Rud va. | bunebrivi faqtorebi, adgilobrivi sasuqebi. xelovnuri sasuqebis mzardi raodenobis gamoyeneba, nayofierebis gadidebis sxva qimiuri, fizikuri da biologiuri saSualebebi. isaxeba gaWuWyianebisgan niadagis dacvis  Roni sZi ebani . |
| IV-ni adagdac vi T i sistemebi.  (wylismieri eroziis sawinaaRmdego, qarismieri eroziis sawinaaRmdego,  War bt eni ani z oni saT vi s. | wylismieri da qarismieri erozia saSiS, agreTve Warbtenian adgilebSi saxnavi miwebis mniSvnelovani nawili uvar gi si mi webi s kat egor i aSi eqceva, ris gamoc aseT miwebze melioraciul RonisZiebebTan erTad tardeba specialuri kompleqsi RonisZiebebisa eroziisa da daWaobebis sawinaaRmdegod. am fonze viTardeba maRalintensiuri mi waT moqmed ebi s sxvad asxva si st ema. | am si st emi saTvis damaxasiaTebelia niadagis nayofierebaze uaryofiTad moqmed i f aqt or ebi s SeCer eba, xel ovnur i nayofierebis siWarbe bunebrivTan  Sedar ebi T . |
| V -samTo miwaTmoqmedebis si st ema | am sistemisaTvis damaxasiaTebelia samTo melioraciis fonze baris miwaTmoqmedebasTan SeTanwyobili samTo meur neobis ganviTareba ZiriTadad mecxoveleobis moTxovnilebebidan gamomdinare; sasoflo-sameur neo savargulebis Tanafardobis gadasinjva myari mcenareuli safaris Seqmnis mizniT, saxnavi farTobis SezRudvis saWiroeba, mcire da saSualo meqanizaciis saSualebaTa farT o gamoyeneba. | niadagis nayofierebis aRdgena-  gadidebis daxSuli biologiuri ciklis Seqmnis RonisZiebani mecxoveleobis wamyvani rolis uz r unvel yof i s pi r obebSi . |
| VI-agr osamr ewvel o kompl eqsi | intensiuri miwaTmoqmedebis umaRlesi formaa, romelic viTardeba industriuli teqnologiis, kompleqsuri meqanizaciis, qimizaciis, eleqtrifikaciis, melioraciis da avtomatizaciis sawyisebze miwaTmoqmedebisa da mrewvelobis Sesabamis dargTa organuli Serwymis pirobebSi. isaxeba da viTardeba unarCeno warmoebis dargebi. miwaTmoqmedebis sistemaSi ganuyofel adgils ikavebs gaWuWyianebisagan gar emos d ac vi s Roni sZi ebani . | niadagis efeqturi nayofiereba ZiriTadad xelovnuri nayofierebis donezea. gansakuTrebuli mniSvneloba eniWeba niadagisa da saerTod garemos gaWuWyianebisagan dacvis RonisZiebaT a kompl eqss. |

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amr i gad , i nt ens i ur i mi waT mo qmed ebi s s i st emas axas i aT ebs S emd egi Zi r i T ad i ni S nebi :

1. maRali kategoriis sasoflo-sameurneo miwebis /saxnavi, mravalwlovani nargavebi/ farTobis zrda gamousadegari da dabali kategoriis miwebis /erodirebui farTobebi, xevebi, buCqnari, dabalnayofieri sZovrebi, daWaobebuli miwebi / farTobis Semcirebis xarjze.
2. soflis meurneobis calkeuli dargebis Sefardeba adgilobriv bunebriveko no mi ur pi r o bebT an, s as o f l o -sameur neo t er i t o r i i s s wo r i o r gani z ac i a.
3. saxnavi miwebis sruli da maRalefeqriani gamoyeneba-Teslbrunvis farglebSi naTesebis swori struqtura, farTobis erTeulze maqsimaluri produqciis uzrunvelyofa Sromisa da materialuri saxsrebis umciresi danaxarjebiT; sxvadasxva Sualeduri /sanawveralo, saSemodgomo, SeTesili da sxva/ da produqciis erTeulze S r o mi s d anaxar j ebi s s i s t emat ur i Semc i r eba.
4. niadagis nayofierebisa da ekologiuri pirobebis sistemuri gaumjobeseba /qarsafari da mindorsacavi zolebis gaSeneba, mzardi qimizacia da eroziis sawinaaRmdego RonisZiebebis gatareba, irigacia, niadagis damuSavebis sistemis saerTo gaumj o bes eba d a s xva./

**gamoyenebul i l i t er at ur a**

* a.aT anel aS vi l i d a s xva. s o f l i s meur neo bi s s af uZvl ebi . T bi l i s i . 1972 .
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redaqtorebi :n.ker es el i Ze

s aaR r i c xvo –s agamo mc eml o T abaxi t i r aJ i 300 gamo mc eml o ba

T bi l i s i 2008 w.