nino vefxiSvili

biologiurad aqtiuri zogierTi stilbenis gamokvleva qarTul wiTel RvinoebSi da maTi teqnologiuri gamoyeneba

sasursaTo teqnologiis doqtoris akademiuri

xarisxis mosapoveblad warmodgenili

d i s e r t a c i a

05.18.07 – alkoholiani da ualkoholo

produqtebis warmoebis teqnologia

mecnier-xelmZRvanelebi – **maTe javaxiSvili**

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sadisertacio naSromis zogadi daxasiaTeba

Temis aqtualuroba. saqarTveloSi mevenaxeobas da Rvinis warmoebis kulturas uSoresi fesvebi aqvs – arqeologiur monacemebze dayrdnobiT, 80 saukunis asaks mainc iTvlis qarTuli kulturuli vazi. msoflios mravali mecnier-specialistis azriT, vazisa da Rvinis samSoblod, swored, saqarTvelo moiazreba, ris dasturadac londonSi XX saukunis dasasruls gaxsnili mudmivmoqmedi gamofena "vinopolisic" gamodgeba _ Ees udidesi „Rvinis qalaqi" qarTuli pavilioniT iwyeba, saxelwodebiT „Rvinis akvani".

saqarTveloSi mravali aTasi wlis ganmavlobaSi 500-ze meti aborigenuli yurZnis jiSisagan Rvinis damzadebis araerTi teqnologiaa SemuSavebuli. isini saukuneTa manZilze Taobidan Taobas gadaecemoda, ixveweboda da iqmneboda axali teqnologiebi. simboluria, rom saqarTvelo, uxsovari droidan vazis da Rvinis qveyana, swored, vazis jvriT eziara qristianobas.

Rvinos, socialur-religiuri funqciis garda, uZvelesi xnidan samkurnalo-profilaqtikuri mniSvneloba hqonda miniWebuli. aRsaniSnavia, enoTerapiis istoriul wyaroebs Soris, grZneul medeas (Zv. w. XIV s) 40 samkurnalo mcenaris nusxa, romelTa Soris vazic moixsenieba. Rvino, jer kidev, babilonis TalmudSi ganxilulia, rogorc erT-erTi yvelaze efeqturi samkurnalo saSualeba.

mecnierTa yuradReba enoTerapiis sakiTxebisadmi SemdgomSic ar Senelebula, magram 1990-iani wlebidan, e. w. ‚franguli paradoqsis" gamovlenam, maqsimalurad gaaqtiura samecnie-ro kvlevebi aRniSnuli fenomenis asaxsnelad. meRvineobis ganviTarebul qveynebSi gansakuTrebiT aqtualuri gaxda Rvinis samkurnalo-profilaqtikuri Tvisebebis Seswavla, romelic dResac uaRresad aqtualuria da warmatebiT mimdinareobs. gamovlinda rigi daavadebebis mimarT wiTeli Rvinis samkurnalo-profilaqtikuri Tvisebebi, romelsac, ZiriTadad, ganapirobebs Rvinis antioqsidanturi aqtivoba. mis ZiriTad wyaros ki Rvinis Semadgeneli fenoluri naerTebi warmoadgens. wiTeli Rvinis zomieri moxmareba ganapirobebs: gulsisxlZarRvTa, iSemiuri, kardiovaskularuli da cerebrovaskularuli daavadebebiT gamowveuli sikvdilis riskis 20-40%-iT Semcirebas.wiTel Rvinos gaaCnia: gacilebiT Zlieri baqteriociduli Tvisebebi, vidre bismutis salicilats. antiaTerogenuli efeqti, antisimsivnuri moqmedeba, proteqtoruli efeqti oqsidaciur stresze. wiTeli Rvino, umetesad, dadebiT efeqts iwvevs gulis koronaruli daavadebebis mimarT. wiTeli Rvinis kardiodamcavi efeqti da dadebiTi zemoqmedeba gulis iSemiur daavadebebze, upiratesad, ganpirobebulia RvinoSi arsebuli rezveratrolis da kvercetinis _ tokoferolTan SedarebiT maRali antioqsidantobis mqone nivTierebebis _ aqtivobiT. fenolebis mravalferovan biologiur aqtivobas Soris upiratesoba antioqsidantur aqtivobas eniWeba. fenoluri klasis

warmomadgenlebi stilbenebi xasiaTdebian maRali biologiuri aqtivobiT da gaaCniaT samkurnalo-profilaqtikuri efeqti sxvadasxva daavadebebis mimarT. stilbenebi msoflios mecnierTa yuradRebis centrSi moeqca `franguli paradoqsis“ gamovlenis Semdeg.

yovelive zemoaRniSnulidan gamomdinare, wiTeli Rvinis gamokvleva stilbenebis da sxva fenoluri naerTebis Semcvelobaze, Rvinis mwarmoebeli qveynebisaTvis da, maT Soris, saqarTvelosTvis friad mniSvnelovania. stilbenebis kvlevis Sedegebidan gamomdinare, dReisaTvis mevenaxeobis, meRvineobis da mebaReobis institutSi SemuSavebulia: rezveratroliT mdidari specialuri sadeserto wiTeli Rvinis damzadebis, bunebrivi stilbenSemcveli koncentratis miRebis teqnologiebi; gansazRvrulia am koncentratis da misi Semadgeneli stilbenebis: trans-rezveratrolis, ε-viniferinis da tetrameruli stilbenebis antioqsidanturi aqtivobani „in vitro“ cdebSi adamianis sisxlis SratSi malondialdehidis warmoqmnis inhibirebis xarisxis mixedviT. SemuSavebulia stilbenSemcveli specialuri TeTri Rvinis damzadebis da Senaxvis optimaluri pirobebi; teqnologiuri damuSavebis meTodebis gavlena stilbenebis Semcvelobaze.

yovelive zemoaRniSnulidan gamomdinare, cxadi xdeba stilbenebis roli wiTeli Rvinoebis samkurnalo-profilaqtikuri Tvisebebis formirebisTvis, rac, udaod, miuTiTebs maTi kvlevis aqtualurobasa da mniSvnelobaze..

kvlevis mizani. kvlevis mizans warmoadgenda biologiurad aqtiuri stilbenis ε-viniferinis (rezveratrolis dimeris) gamokvleva qarTul wiTel RvinoebSi da misi teqnologiuri gamoyeneba.

kvlevis amocanebi:

- ε-viniferinis identifikacia da raodenobrivi gansazRvra saqarTveloSi gavrcelebul feradyurZnian vazis jiSebSi;
- sufris mSrali, bunebrivad naxevradtkbili da postfermentuli maceraciiT Rvinomasalebis damzadeba da Rvinis tipis gavlenis dadgena ε-viniferinis Semcvelobaze.
- ε-viniferinis cvalebadobis dadgena Rvinomasalebis erTwliani formirebis periodSi da gardaqmnis produqtis gamokvleva;
- trans-rezveratrolis, ε-viniferinis da misi gardaqmnis produqtis gansazRvra qarTul wiTel RvinoebSi;
- ε-viniferinis aqtivobis gamovlena vaSl-rZemJava duRilze wiTel RvinomasalaSi;
- qarTuli wiTeli Rvinoebis fenoluri speqtrisa da maTi antioqsidanturi aqtivobebis Seswavla;
- wiTeli Rvinoebis antioqsidanturi Rirebulebis ganmsazRvreli miznobrivi funqciis zogadi maTematikuri modelis Sedgena.

- antioqsidanturi nivTierebebiT gamdidrebuli alkoholuri sasmelebis damzadebis teqnologiebis SemuSaveba.

mecnieruli siaxle.

- qarTul wiTel RvinoebSi da feradyurZnian vazis jiSebSi identificirebulia da gamokvleulia ε-viniferini da misi dimeri - tetrameruli stilbeni;

- dadgenilia, rom yurZnis kanebSi trans-rezveratrolis raodenoba aRemateba ε-viniferinis raodenobas da tetrameruli stilbeni mcire raodenobiT fiqsirdeba;

- gamovlenilia Rvinomasalebis erTwliani formirebis periodSi ε-viniferinis Semcireba-gardaqmna dimerizaciis mimarTulebiT da identificirebulia tetrameruli stilbeni;

- dadginda biologiurad aqtiuri stilbenebis dagrovebaze postfermentuli maceraciis dadebiTi gavlena;

- postfermentuli maceraciiT damzadebul sufris mSral wiTel RvinoebSi **tetrameruli stilbenis wyarod** gamovlinda yurZnis wipwa;

- qarTul wiTel RvinoebSi erTdroulad dafiqsirda monomeruli, dimeruli da tetrameruli stilbenebi trans-rezveratrolis, ε-viniferinis da tetrameruli stilbenis saxiT. maT Soris dominantia trans-rezveratroli;

- dadginda, rom ε-viniferinisa da trans-rezveratrolis **gazrdili** koncentracia garkveul aqtivobas amJRavnebs vaSl-rZemJava duRilis ZiriTad da Tanaur produqtebze wiTel RvinomasalebSi, maSin roca igive nivTierebebis **bunebrivi** koncentracia uaryofiT gavlenas ar axdens Rvinomasalis xarisxze;

- dadginda qarTuli wiTeli Rvinoebis antioqsidanturi aqtivoba maTi fenoluri naerTebis SemcvelobasTan damokidebulebiT...

N

naSromis praqtikuli mniSvneloba

-Ffenoluri naerTebiT, maT Soris, stilbenebiT gamdidrebuli da samkurnalo-profilaqtikuri daniSnulebis wiTeli Rvinoebis damzadeba rekomendirebulia postfermentuli maceraciis gamoyenebiT;

- wiTeli Rvinoebis stilbenebiT gamdidrebis saWiroebis SemTxvevaSi, stilbenebis damateba mizanSewonilia vaSl-rZemJavuri duRilis Catarebis Semdeg;

- saferavis kanis stilbenuri naerTebis kvlevis mniSvnelovani Sedegebis gaTvaliswinebiT, SemuSavebulia antioqsidanturad aqtiuri alkoholuri sasmelis, pirobiTad, “zigu+”-is damzadebis teqnologia;

- antioqsidanturi aqtivobis mixedviT Rvinomasalis interaqtiul reJimSi SerCevis mizniT, maTematikuri modelirebis safuZvelze daproeqtebulia qarTuli wiTeli Rvinoebis sainformacio-saanalizo monacemTa baza.

aprobacia. kvleviTi samuSaos Sedegebi 2009_2011 ww. ixileboda iakob gogebaSvilis sax. Telavis saxelmwifo universitetis soflis meurneobisa da gadamamuSavebeli dargebis fakultetis da mevenaxeobis, meRvineobis da mebaReobis institutis samecniero sabWos sxdomebze.

publikacia. sadisertacio naSromis irgvliv gamoqveynebulia 7 samecniero naSromi. maT Soris erTi – vazis da Rvinis 33-e msoflio kongresis da ori - konferenciis masalebis saxiT.P

sadisertacio naSromis struqtura da moculoba. sadisertacio naSromi Sedgeba: sadisertacio naSromis zogadi daxasiaTebis, literaturis mimoxilvis, eqsperimentuli nawilis, daskvnebis da danarTisagan. naSromi ganTavsebulia 129 gverdze, Seicavs 19 cxrils da 27 naxazs. gamoyenebuli literaturis sia moicavs 128 dasaxelebas.

1. literaturuli mimoxilva

1.1. wiTelyurZniani vazis jiSebis da wiTeli Rvinoebis fenoluri naerTebi da biologiuri aqtivobani

wiTelyurZniani vazis jiSebis da, Sesabamisad, wiTeli Rvinoebis qimiur SedgenilobaSi mniSvnelovan adgils ikavebs fenoluri klasis nivTierebebi. es farTo da mravalferovani klasi, ZiriTadad, warmodgenilia flavonoiduri da araflavonoiduri jgufebis komponentebiT. araflavonoidurs warmoadgens stilbenebi, fenolkarbonmJavebi, fenolaldehidebi das xv. Fflavonoiduri speqtri ki warmodgenilia flavan-3-olebiT, oligomeruli da polimeruli proantocianidinebiT, antocianebiT, flavonolebiT, flavononebiT da sxv.

yurZnis fenoluri naerTebi alkoholuri duRilis Sedegad lokalizirdeba RvinomasalaSi bunebrivi formiT, Tumca, unda aRiniSnos, rom zogierTi maTgani alkoholur duRilSi ganicdis gardaqmnebs da warmoebulebis saxiT amdidrebs Rvinomasalis qimiur Sedgenilobas. Ffenoluri nivTierebebi aqtiurad monawileobs Rvinomasalebis formirebis periodSi mimdinare Jangva-aRdgeniT gardaqmnebSi da mniSvnelovan gavlenas axdens Rvinis organoleptikur maCveneblebze. Ggarda amisa, fenoluri nivTierebebi xasiaTdeba sxvadasxva mimarTulebiT gamoxatuli maRali biologiuri aqtivobebiT (gansakuTrebiT antioqsidanturi aqtivobiT), riTac, faqtobrivad, ganapirobebs wiTeli Rvinis sasargeblo Tvisebebs da samkurnalo-profilaqtikur Rirebulebas. Aaqedan gamomdinare, wiTeli Rvinoebis axali fenoluri nivTierebebis kvleva maTi samkurnalo-profilaqtikuri Tvisebebis asaxsnelad, maTi fiziologiuri rolis Seswavla cocxal organizmSi mimdinare mravalferovan bioqimiur gardaqmnebSi, - dReisaTvis warmoadgens saerTaSoriso masStabis kvlevis aqtualur mimarTulebas.

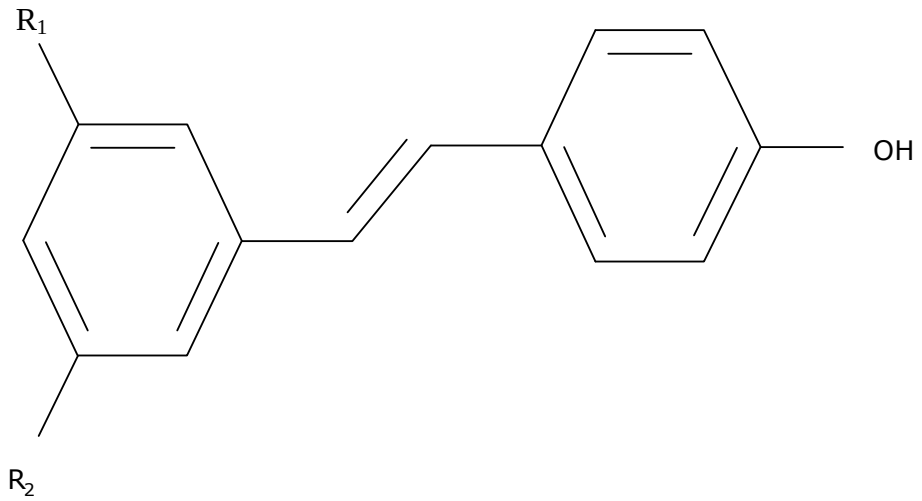
saqarTveloSi gavrcelebuli unikaluri vazis wiTelyurZniani jiSebis da wiTeli Rvinoebis qimiuri Sedgenilobis kvlevaSi didi wvlili Seitanes qarTvelma mecnierebma. dReisaTvis arsebuli mniSvnelovani mecnieruli monacemebi, swored, maT damsaxurebad unda CaiTvalos.

dRes gansakuTrebiT didi mniSvneloba eniWeba maRalxarisxovani Rvinoebis warmoebas, romelzedac didadaa damokidebuli msoflios sxvadasxva qveynis bazarze qarTuli Rvinis damkvidreba. Aamitomac, kvlevebi kvlav grZeldeba da mecnieruli siaxleebiT mdidrdeba mevenaxeobis da meRvineobis fundamentaluri safuZvlebi, romelic, Tavismxriv, maRalxarisxovani qarTuli Rvinoebis warmoebis sawindaria.

Y yovelive zemoaRniSnuls exmaureba qarTul wiTelyurZnian vazis jiSebsa da wiTel RvinoebSi Cven mier Catarebuli stilbenoidebis gamokvlevebi, aseve _ warmodgenili sadisertacio naSromis eqsperimentaluri monacemebi da daskvnebi.

Aaraflavonoiduri fenoluri naerTebi.

stilbenoidebi. maT zogadad gamosaxaven warmodgenili formuliT. stilbenoidebi gavrcelebulia monomeruli, dimeruli, trimeruli, tetrameruli da oligomeruli stilbenebis saxiT. Aaseve gvxvdeba zogierTi glikoziduri forma. Mmag. Ppiceidi warmoadgens rezveratrolis glukozids.



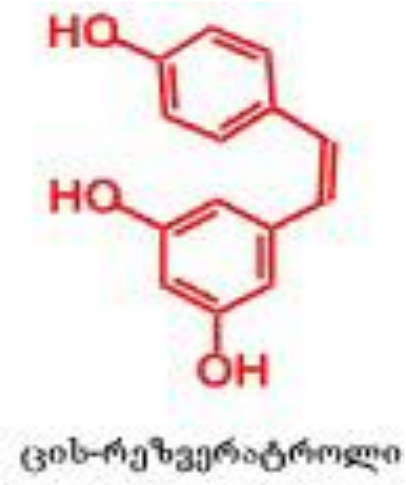
stilbenoidebis zogadi formula

stilbenebi	R_1	R_2
fterostilbeni	**OCH_3**	**OCH_3**
rezveratroli	**OH**	**OH**
piceidi	**OGlc**	**OH**

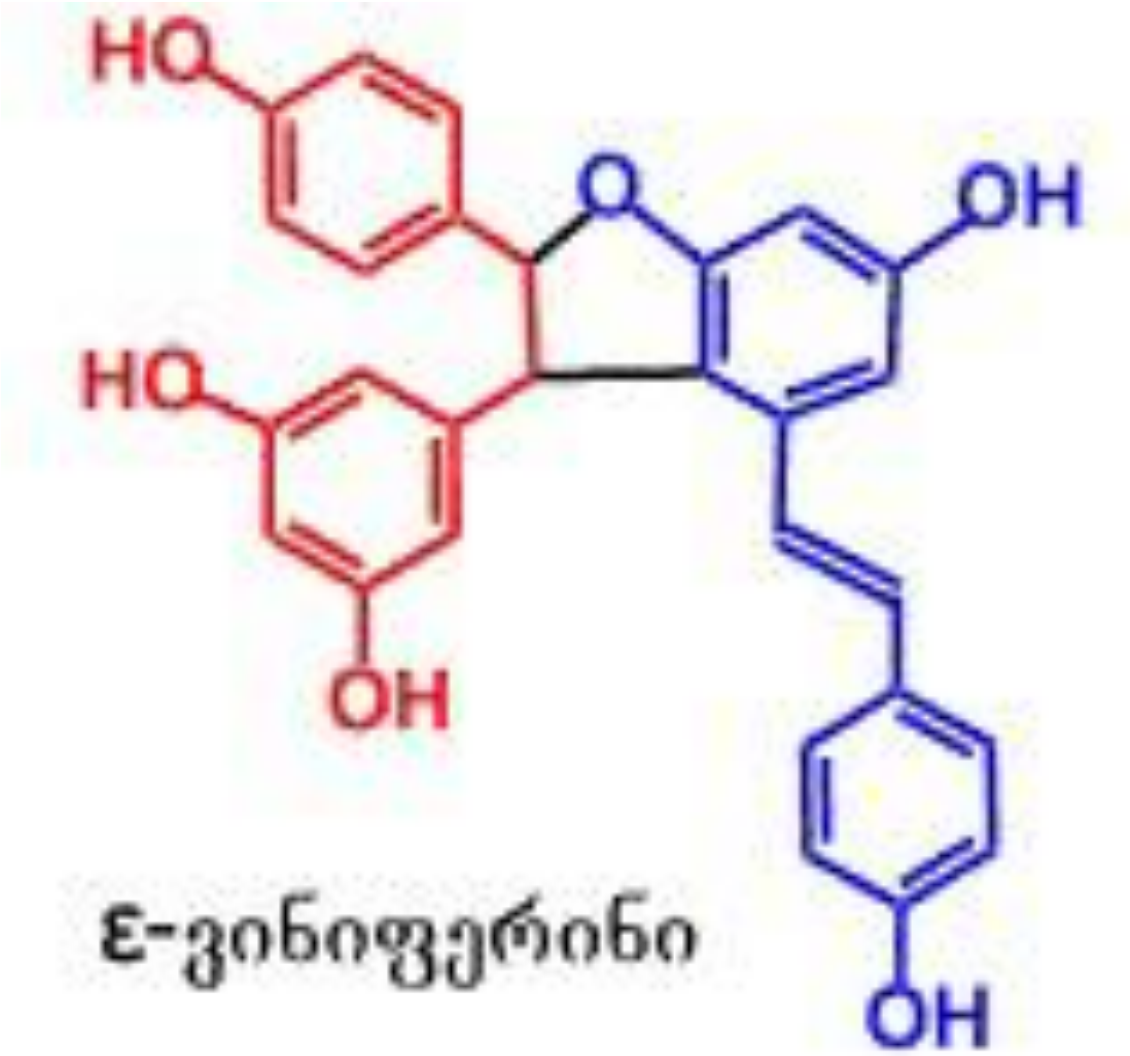
rezveratroli - (3,5,4[1]- trihidroqsistilbeni) - stilbenoidebis monomerul komponents, glikozidebisa da polimerebis Semcveli stilbenuri klasis sawyis wevrs warmoadgens.

rezveratroli mcenareul qsovilebSi cis- da trans- izomeruli formiT arsebobs. rezveratrolis sinTezireba ganpirobebulia stresiT, infeqciuri dazianebiT an ultraiisferi dasxivebiT.

stilbenoidebis msgavsad, rezveratroli fitoaleqsinia da fungiciduri Tvisebebis matarebelia.



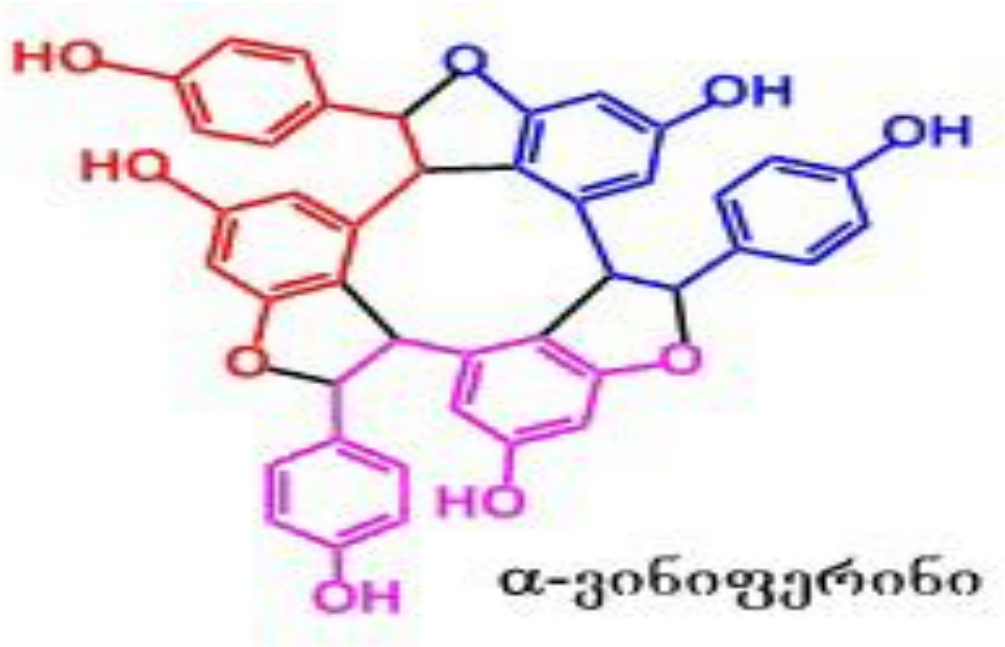
vazisTvis es metad mniSvnelovania. Llenqeiqis da TanaavtorTa mier (1977,1981) vazis “Vitis vinifera viticeae”-s Botritis cinerea-s mikroorganizmebiT daavadebuli foTlebidan, individualuri saxiT gamoyves fitoaleqsinebi: trans-rezveratroli, ε-viniferini da α-viniferini.



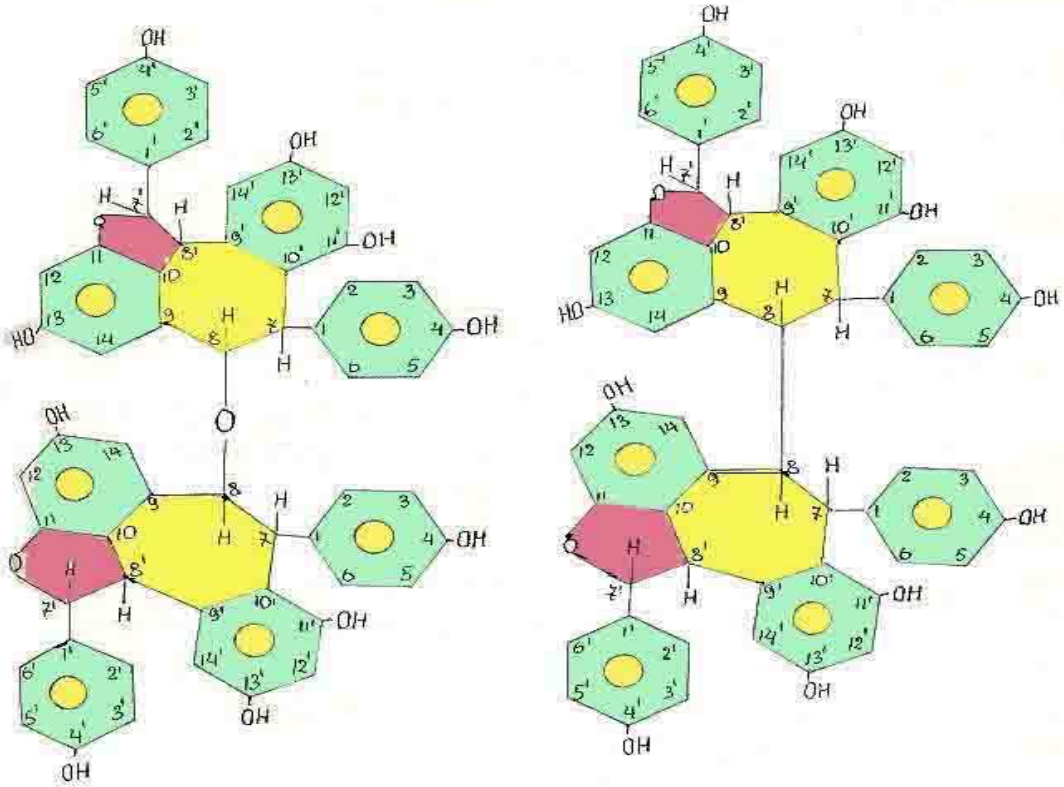
ε-ვინიფერინი

δ–ვინიფერინი

tetrameridan **“Welvitshia mirabilis”** gamoyofili da identificirebulia rezveratroli da misi oligomeruli nawarmebi: gnetin – **A,** gnetin – **B, C, D** da gnetin – **E**. oligomeruli stilbenebi identificirebulia agreTve **“Maaskia amurensis”** merqnis spirtian eqstraqtidan (kuleSi da sxv., 1992).



vazis stilbenoidebis kvleva saqarTvelos mevenaxeobis, meRvineobis da mebaReobis institutSi daiwyo 1991 wlidan – vazidan trans-rezveratrolis, ε-viniferinis da ori tetrameruli stilbenis gamoyofiT da identifikaciiT (beJuaSvili da sxv. 1991, 1994, 1997). trans-rezveratroli gansazRvrulia saqarTveloSi gavrcelebul vazis wiTelyurZnian jiSebSi (saferavi, kaberne sovinioni, ocxanuri safere, Tavkveri) da maTgan damzadebul sxvadasxva tipis RvinoebSi (koxtaSvili da sxv. 1998, 2002); Ddadgenilia Rvinis tipis gavlena trans-rezveratrolis koncentraciaze: sufris mSral, bunebrivad naxevradtkbil da Semagrebul Rvinoebs Soris, trans-rezveratrols meti raodenobiT Seicavs Semagrebuli Rvinoebi. Kkoncentraciis cvlileba Semdeg farglebSi meryeobs: saferavisTvis 0,78-3,52 mg/l; kabernesTvis 0,65-2,87 mg/l; ocxanuri saferesTvis 0,69-2,62 mg/l; TavkverisTvis 0,47-1,92 mg/l; SemuSavebulia WaWaSi narCeni trans-rezveratrolis gamoyenebis sqema specialuri sadeserto wiTeli Rvinis teqnologiis saxiT, romelic rezveratrolis raodenobis 2-5 mg/l amaRlebis saSualebas iZleva (koxtaSvili, 2006).



vazidan gamoyofili tetrameruli stilbenebi

trans-rezveratrolis biologiuri aqtivoba Seswavlil iqna Rvinis safuarebis, ZmarmJava baqteriebis da vazis kibos gamomwvevi Agrobacterium tumefaciens-is mimarT. dadginda Rvinis safuarebze trans-rezveratrolis mastimulirebeli moqmedeba (koxtaSvili da sxv., 1999); ZmarmJava baqteriebi trans-rezveratrolis moqmedebas ar daeqvemdebara; vazis kibos gamomwvevi baqteriebis mimarT gamoavlina mkveTri antagonisturi moqmedeba (beJuaSvili da sxv., 1999).

rezveratrolis biologiuri aqtivobis gamo, misi gamokvleva wiTel RvinoebSi meRvineobis ganviTarebul qveynebSi aqtualuri sakiTxi gaxda. Bbarselonasa da kaliforniis universitetebis mkvlevarebis mier (romero-perezi da sxv. 1996) espanur TeTr da vardisfer RvinoebSi Seswavlili iqna trans- da cis-rezveratrolis da maTi glukozidebis – piceidebis - koncentraciebi siTxuri qromatografiis meTodiT (lamuela-raventosi da sxv. 1995). trans-rezveratroli dafiqsirda

0,2-1,06 mg/l intervalSi; cis-rezveratroli 0,02-0,97mg/l; trans-piceidi 0,12-0,91 mg/l; cis-piceidi 0,08-1,89 mg/l; gamonaklisi aRmoCnda pino Savisgan damzadebuli vardisferi Rvinoebi, romlebSic cis-rezveratroli da cis-piceidi Sesabamis trans formebze meti aRmoCnda.

amerikul wiTel RvinoebSi trans-rezveratrolis Semcveloba dafiqsirda 3,6-12,2 ppm (lamikarna da sxv.1996). franguli komerciuli wiTeli Rvinoebi rezveratrols Seicavs Semdegi raodenobiT: kaberne sovinioni - 3,4 mg/l; grenaJi - 1,8 mg/l; gamei - 2,5 mg/l; mourvedri - 4,8 mg/l; Savi pino - 5 mg/l (roJero da sxv.1994).

kanadur wiTel RvinoebSi cis-rezveratrolis saSualo koncentraciam Seadgina 1,43 mg/l; kaliforniulSi 1,10 mg/l; avstraliurSi 1,07 mg/l; samxreT amerikulSi 0,54 mg/l; samxreT afrikulSi 0,64 mg/l. cis-rezveratroli maRali koncentraciiT dafiqsirda oregonis RvinoebSi - 2,94 mg/l. franguli Rvinoebidan rezveratrols maRali koncentraciiT Seicavs burgundiuli wiTeli Rvino - 3,4 mg/l. Aavtorebi aRniSnaven, rom burgundiuli Rvinoebis warmoebisaTvis 50%-ze meti kabernes yurZeni gamoiyeneba. igive jiSisgan kaliforniaSi, samxreT amerikasa da avstraliaSi damzadebuli Rvinoebi, burgundiulTan SedarebiT, rezveratrols naklebi raodenobiT Seicaven. Aam faqts avtorebi xsnian rezveratrolis warmoqmnaze iseTi faqtorebis moqmedebiT, rogoricaa vazis jiSi, niadagi, drenaJis xasiaTi, Rvinis damzadebis teqnologia (goldbergi da sxv. 1995).

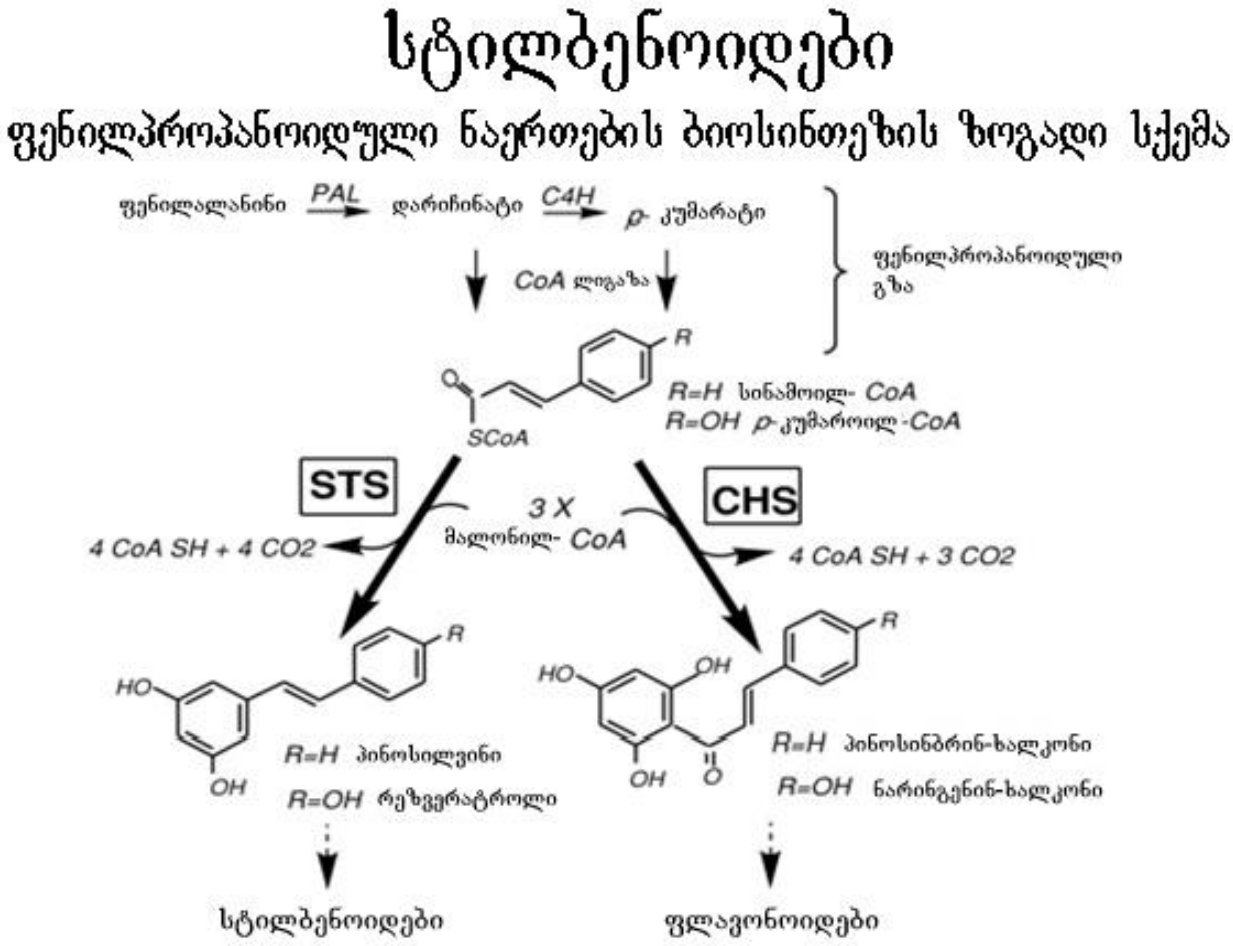
rezveratrolis raodenobrivi gansazRvris sxvadasxva meTodebi arsebobs: siTxuri, gazur-siTxuri qromatografiis, qromatomasspeqtrometruli da sxva, romelTa safuZvelze dadgenilia rezveratrolis Semcveloba kaliforniul, espanur, italiur, germanul, avstraliur da sxv. Qqveynebis RvinoebSi (lamuela-raventosi da sxv. 1993; 1995; mativi 1993[a],1993[b]; memurtrei da sxv. 1994; Jendeti da sxv. 1993; goldbergi da sxv. 1994; 1995; sato da sxv. 1997). landetis da TanaavtorTa mier (1991) Seswavlilia rezveratrolis warmoqmna da lokalizacia Vitis vinifera-s da Vitis labrusca-s yurZnis kanSi.

adrainis da TanaavtorTa mier (2000), Vitis vinifera-s ramdenime jiSis yurZnis kanSi gansazRvrul iqna rezveratroli da misi warmoebulebi: piceidi, fterostilbeni da ε-viniferini. Ddafiqsirda raodenobrivi gansxvaveba Botrytis cinerea-s sokoTi daavadebul da saR yurZens Soris. Aaseve, paralelurad, ultraiisferi sxivebis gavlena stilbenebis Semcvelobaze.

baderSnaideris da TanaavtorTa mier (2000), pirvelad rislingis RvinoebSi, identificirebuli da gansazRvrulia rezveratrolis warmoebulebi: izomeruli rezveratrol-2-glukozidi; dimeruli stilbenebi, cis- da trans - ε-viniferinis diglukozidebi; palidolis glukozidi da diglukozidi.

cnobilia, rom stilbenebis da fenilpropanoiduli nivTierebebis biosinTezi mimdinareobs saerTo sawyisidan da amosaval nivTierebas fenilalanini warmoadgens. rogorc sqemidan Cans, stilbenebis biosinTezs anxorcielebs fermenti stilbensinTaza. aRniSnuli rTuli gardaqmnebis regulacia molekulur doneze Seswavlilia beiais da TanaavtorTa mier (2000) vazis yvavilobis Semdgom periodSi, ultraiisferi sxivebis da Botrytis cinerea-s moqmedebebTan mimarTebaSi.

Eeqsperimenti Catarebulia avstraliaSi gavrcelebuli kaberne sovinionis, Sirazis, Sardones da semilionis jiSis yurZnis kanebze. aRniSnuli faqtorebis gavlena gamoxatulia stilbensinTazas genis eqspresiiT.



kantosis da TanaavtorTa mier (2001) ultraiisferi sxivebiT damuSavda sufris yurZeni, romelSic rezveratrolis koncentracia gaizarda 3 mg-mde da es meTodi SeTavazebul iqna sufris yurZnis, rogorc ”funqciuri sakvebis” warmoebisaTvis. igive avtorebis mier (2002) SemuSavebuli meTodis gamoyenebis areali gafarTovda da moicva rogorc TeTri, ise wiTelyurZniani sasufre jiSebi, mokrefis Semdeg. ikvlevdnen stilbenoidebis raodenobriv

matebas siTxuri qromatmas-speqtruli meTodiT. Ddadginda rezveratrolis, piceidis, piceatanolis, palidolis da viniferinis raodenobrivi cvlileba.

kantosis da TanaavtorTa mier (2003) gaTvaliswinebul iqna ultraiisferi sxivebis moqmedeba stilbenebze da Rvinis dasamzadeblad gankuTvnili, mokrefili yurZeni daamuSaves ultraiisferi sxivebiT. Sedegad damzadebul wiTel RvinoSi rezveratrolis da piceatanolis koncentraciebi Sesabamisad gaizarda 2-jer da 1,5-jer. Eenologiuri parametrebis cvlilebaze, rogoric aris feri, mJavianoba da sxv, uaryofiTi gavlena ar mouxdenia.

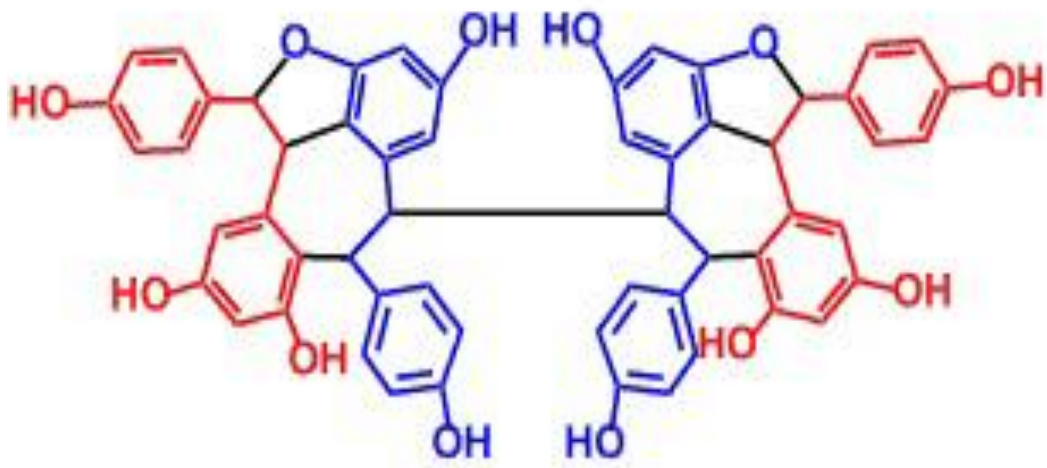
caiCivaizis da TanaavtorTa mier (2000) Catarda rezveratrolis dimerizaciis SesaZleblobebis gamokvleva Botrytis cinerea-s mikroorganizmebiT daavadebul yurZensa da, paralelurad, modelur cdaSi, sadac trans-rezveratrolTan erTad moTavsebuli iyo Botrytis cinerea ATCC 11542. Sedegad identificirda rezveratrolis oqsidaciuri dimerebi: rezveratrolis trans-dehidrodimeri, palidoli da leahinol F.

frangul da portugaliur komerciuli wiTeli Rvinoebis 120 nimuSSi de limas da TanaavtorTa mier (1999) dadginda da ganisazRvra trans- da cis-rezveratrolis, trans- da cis-piceidebis, trans-astringinis Semcveloba. maT Soris, pirvelad identificirda da ganisazRvra trans-astringini.

Ffornenim da Tanaavtorebma (2008) Seiswavles stilbensinTazas lokalizaciis adgili yurZnis marcvalSi. yurZenSi, kerZod yurZnis kanSi, stilbenebis biosinTezi gamokvleul iqna biotikur da

abiotikur faqtorebTan kavSirSi. Aam mizniT eqsperimentis msvlelobisas isazRvreboda stilbensinTazas, fenil alanin-amonium liazas, 4-kumarat-CoA –ligazas maCveneblebi. sacdel obieqtebs warmoadgenda Vitis vinifera-s 78 jiSi, 3 wlis ganmavlobaSi (gato da sxv., 2008). Ggenomis da stilbenoidebis urTierTkavSiris sakiTxebi asaxulia aseve grimpletis da TanaavtorTa gamokvlevaSi (2009).

GsamxreT afrikul wiTel RvinoebSi, trans-rezveratrolTan erTad, dafiqsirda warmoebuli stilbenoidebi. kerZod, trans-piceidi, trans-epsilon-viniferini, palidoli da astilbini Aavtorebis mier pirvelad wiTel RvinoSi identificirda da ganisazRvra rezveratrolis tetrameri – e. w. hopifenoli. 0.66-3.45 mg/l trans-rezveratroli, 0.2-1.2 mg/l trans-epsilon-viniferini, 0.2-9.2 mg/l palidoli, 0.3-3.8 mg/l hopeafenoli, da 10.8-24.22 mg/l astilbini. (gubailai da sxv., 2006).



ჰოპეაფენოლი (ამპელოპსინ B-ს დიმერი)

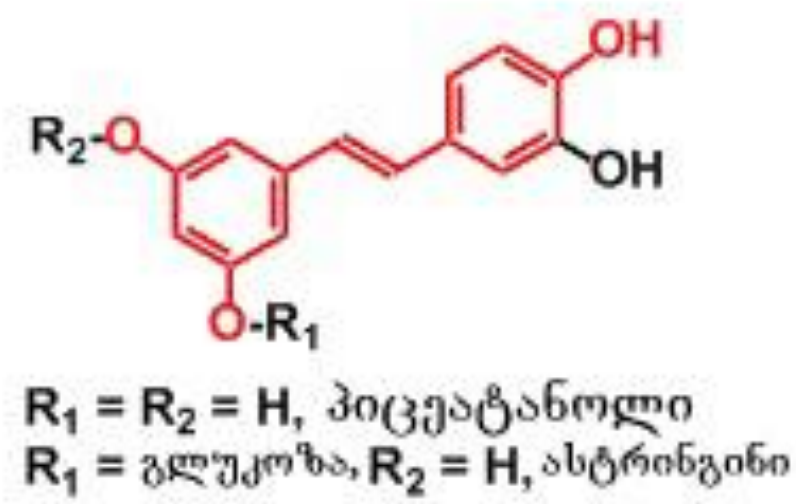
Vitis labrusca-s saxeobis konkordis jiSis yurZnis marcvlis mezokarpiumSi aRmoCenilia bifunqcionaluri fermenti: rezveratrol-oqsidariCinmJava-glukozil-transferaza, romelic anxorcielebs stilbenebis glukozidebis da oqsidariCinmJavebis glukozuri eTerebis biosinTezs (heili da sxv., 2007).

aitos da TanaavtorTa mir (1999), Vitis vinifera-s saxeobis Kyohou'-s jiSis yurZenSi aRmoCenili da identificirebulia oligomeruli stilbenebi: viniferinfurani, (+)-vitisifurani AA da (-)-vitisifuran B.

Vitis vinifera-s genomis da stilbenebis Seswavlas mieZRvna rigi gamokvleva: Jailonis da TanaavtorTa (2007), aseve velaskos da sxv. (2007). gamokvleulia vazis stilbensinTazas dnm da fermentuli aqtivoba. (malCairi da sxv. 1990).

monastrelisgan damzadebul espanur wiTel RvinoSi stilbenebis saerTo raodenobam Seadgina 30 mg/l, maT Soris 82-91 % rezveratrolis wilia. saeqsperimentod aRebuli iyo Rvinis 135 nimuSi (moreno-labanda da sxv., 2004).

Nova Scotia-s (kanadis atlantikis regioni**)** komerciul RvinoebSi,romlebic damzadebuli iyo kanaduri da franguli hibriduli vazis jiSebidan, gansazRvrulia stilbenoidebi: trans-rezveratroli 0.148 - 4.547 mg/l, cis-rezveratroli, piceidi, astringini, palidoli (neigleri das xv., 2007).



rezveratrolis dehidrodimeri cnobilia ori izomeris saxiT: ε-viniferini da δ-viniferini. Ees ukanaskneli identificirda **leaves** yurZnidan**,** romelic dainficirebuli iyo *Plasmopara viticola*-Ti da paralelur variants warmoadgenda ultraiisferi sxivebiT dasxivebuli igive yurZeni. imavdroulad δ-viniferini warmoiqmna oqsidaciuri gziT rezveratrolisgan in vitro pirobebSi (pezeti da sxv., 2003).

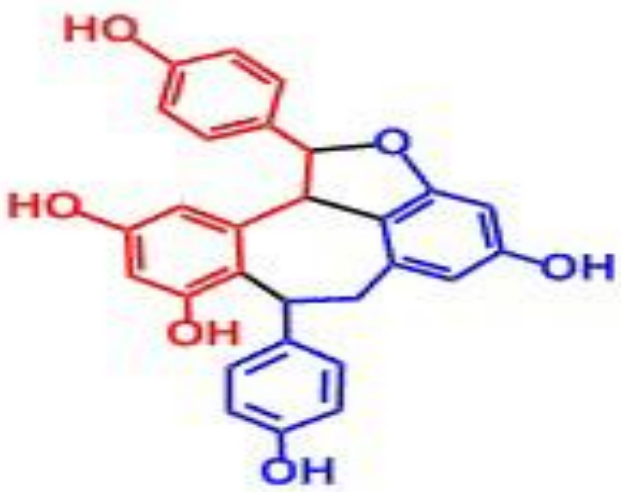
wiTeli Rvinis stilbenoiduri komponenti rezveratroli da piceatanoli, xasiaTdebian antikancerogenuli efeqtiT. es dadasturebulia citoqrom **P_{450}-**is mimarT (poteri da sxv., 2002).

romero-perezis da TanaavtorTa mier (1999) wiTel da TeTr yurZnis wvenSi ganisazRvra piceidi da rezveratroli. wiTeli yurZnis wvenSi trans-piceidi aRmoCnda dominanti – 3,38 mg/l,

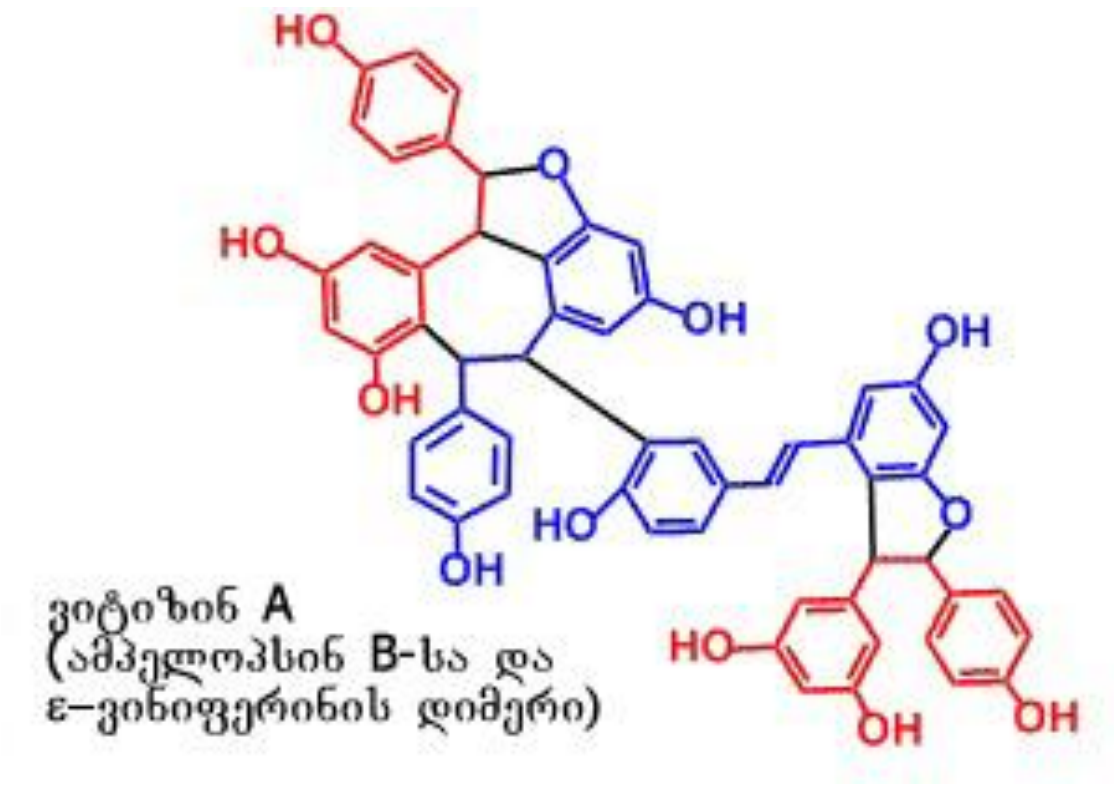
xolo cis-piceidi – 0,79 mg/l. TeTri yurZnis wvenSi Sesabamisad 0,18 mg/l da 0,26 mg/l. trans-rezveratroli - 0,05 mg/l, cis-rezveratroli ki _ ar dafiqsirebula.

iaponiaSi gavrcelebuli pino Savis da merlotis wiTel RvinoebSi stilbenoidebis saerTo raodenoba (trans- da cis-rezveratroli, trans- da cis-piceidi) Seadgens 4,37 mg/l; TeTr RvinoebSi ki, 0,69 mg/l (sato da sxv., 1997).

Ciles RvinoebSi, romlebic damzadebulia kaberne sovinionisgan, Svarzis da TanaavtorTa mier (2003), identificirda tetrameruli stilbeni vitisin A.



ამპელოპსინ B



rezveratrolis tetramerebis – vitisin A-s da hopifenolis biologiuri aqtivoba gamovlinda apoptozisis saxiT (saia das xv., 2009).

sparvolais da TanaavtorTa mier (1994) molekulur doneze Seswavlilia Vitis vinifera L yurZnis stilbenebis da flavonoidebis biosinTezSi monawile fermentebi: fenilalanin-amonium-liaza, xalkon sinTaza, flavanon-3-hidroqsilaza,xalkon-izomeraza, dihidroflavonol 4-reduqtaza, leikoantocianidin-dioqsigenaza, glukoz-flavonoid-3-O-glukozil-transferaza.

Vitis vinifera–s jiSebis: kastelao, Sirazi da tinta _ yurZnis kanSi gansazRvrulia zogierTi stilbeni, romelTa Soris dominanti raodenobiT dafiqsirda trans-piceidi. Sesabamisad 67.24, 10.43 da 11.57 mg/kg. cis-piceidi dafiqsirda mxolod kastelaos yurZnis kanSi 58,9 mg/kg koncentraciiT. trans-rezveratroli sacdel yurZnis kanebSi ar dafiqsirebula. Sesabamis RvinoSi cis-piceidis nacvlad aRmoCnda trans-piceidi, rasac avtorebi xsnian kanidan cis-piceidis eqstraqciiT da misi Semdgomi izomerizaciiT trans-formaSi (sani das xv., 2006).

Vitis vinifera-s yurZens mokrefis Semdeg Cautarda ultraiisferi sxivebiT damuSaveba da 58 dRis ganmavlobaSi mecnierebi akvirdebodnen stilbensinTazas aqtivobas da trans- da cis-rezveratrolis, aseve maTi Sesabamisi piceidebis cvlilebas. Ggamovlinda stilbensiTazas aqtivacia da rezveratrolis koncentraciis gazrda 38 mkg/g-iT (versali da sxv. 2001).

braziliuri wiTeli Rvinoebis 12 nimuSSi ganisazRvra stilbenoidebi: trans- da cis-rezveratroli, δ-viniferini, ε-viniferini, piceidebi. merlotis RvinoSi dafiqsirda 10 mg/l δ-viniferini, 15 mg/l cis-rezveratroli da 13 mg/l trans-piceidi. Aavtorebi am Rvinis yoveldRiur misaReb

dozad miiCneven 160 ml (vaitreki da sxv. 2005). aqve unda aRiniSnos, rom piceidic maRali biologiuri aqtivobiT gamoirCeva. magaliTad, trans-piceids Seicavs Polygonum cuspidatam-is fesvebi, romelsac CineTsa da iaponiaSi aTerosklerozis samkurnalod iyeneben.

vafo-tiguos da TanaavtorTa mier (2001), Vitis vinifera-s yurZnidan pirvelad identificirebulia dimeruli stilbenebis glukozidebi. kerZod, rezveratrolis dehidrodimeri - 11-O-ß-D- glukopiranozidi; rezveratrolis dehidrodimeri-11^1-O-ß-D-glukopiranozidi. maTTan erTad dafiqsirda rezveratrolis dehidrodimeris da palidolis arsebobac.

ultraiisferi sxivebis mastimulirebeli efeqti kaberne sovinionSi rezveratrolis biosinTezsa da stilbensinTazas gaaqtiurebaze, dadgenilia vangis da TanaavtorTa mier (2010).

Ppiceidi anu rezveratrolis-3-ß-glukozidi, yurZnis marcvalSi identificirebulia vaterhouzis da sxv. mier (1994).

rezveratrolis garda, identificirebuli stilbenebi gamoirCevian maRali antioqsidanturi aqtivobiT, rac dadasturda adamianis sisxlis SratSi malondialdehidis warmoqmnis inhibirebis xarisxis saxiT “in vitro” cdebSi. antioqsidanturi aqtivoba Seadgens: trans-rezveratrolis – 105%; ε-viniferinis - 118%; tetrameruli stilbeni I-is – 169%; tetrameruli stilbeni II-is -178% etalonur nivTierebasTan SedarebiT (beJuaSvili da sxv. 2005).

rogorc zemoT aRvniSneT, stilbenoidebi da, maT Soris, rezveratroli biologiur aqtivobas avlenen sxvadasxva mimarTulebiT. dadgenilia, rom trans-rezveratroli ufro aqtiuria, vidre cis-rezveratroli da axasiaTebs antioqsiodanturi, antianTebiTi, baqteriociduli, antivirusuli, antitrombuli da sxv. Aaqtivoba, samkurnalo-profilaqtikur moqmedebas avlens gulsisxlZarRvTa, simsivnur da sxv. daavadebebze. warmoadgens fitoestrogens (blondi das xv., 1995; iangi da sxv., 1997; doxerti das xv., 2007; berTeli da sxv., 1995; kuleni da sxv., 2007).

Ɍezveratrolȣ aRmoaCnda kibosgan damcavi efeqti. igi gamovlinda, rogorc qemodamcavi agenti, romelsac SeuZlia kancerogenezis riskis Semcireba. qemodamcavi agentebi inhibirebas ukeTebs ciklooqsigenazas, romelic akatalizebs simsimnis ujredebis gamravlebas da asustebs imunur sistemas. Aaseve, SeuZlia xeli SeuSalos iseTi kancerogenuli formebis warmoqmnas, romelic azianebs genetikur nivTierebebs. ramdenime wlis ganmavlobaSi mimdinareobda mcenareuli eqstraqtebis gamocda qemodamcavi agentis Ziebis mizniT. Sedegad SerCeuli erT-erTi mcenareuli eqstraqtis SedgenilobaSi aRmoCnda rezveratroli. dadginda, rom adamianis organizmSi rezveratroli warmoadgens kibosgan damcav saSualebas. aqedan gamomdinare, rezveratrolis Semcveli sakvebis xangrZlivi miReba iTvleba dietur-profilaqtikur saSualebad (iangi, 1997). trans-rezveratrolis samkurnalo efeqtze miuTiTebs misi inhibitoruli moqmedeba polimorfonukleuri leikocitebis funqciaze. polimorfonukleuri leikocitebi mniSvnelovan rols asrulebs gulis koronaruli daavadebis wina periodis paTogenezSi. trans-rezveratroli aRniSnuli leikocitebiT producirebul aqtiur Jangbadze inhibitorad moqmedebs. igi Tavidan gvacilebs

leikocitebis homotipiur agregacias da maT SeuRlebas platelitebTan (rotondo da sxv., 1998). rezveratrols aRmoaCnda aseve ribonukleotiduri reduqtazebis inhibirebis unari, rac SemdgomSi mJRavndeba kibos sawinaaRmdego TvisebebSi (fonteseivi da sxv., 1998).

Cikagos universitetis mkvlevarTa azriT, wiTel RvinoSi arsebuli rezveratroli warmoadgens fitoestrogens mcenareuli nivTierebebis jgufidan da mas gaaCnia estrogenis msgavsi zemoqmedeba. wiTeli Rvino ufro estrogenulia vidre burboni an ludi. Tumca, es sasmelebi Seicaven fitoestrogens, maTSi rezveratroli ar gvxvdeba.

ε-viniferini, rezveratrolis msgavsad, fitoaleqsinia (bavaresko da sxv., 2008; jaindro da sxv.,2007). rigi gamokvlevebi adastureben ε-viniferinis sxvadasxva mimarTulebiT gamoxatul biologiur aqtivobas. Bbunebrivi ε-viniferinis antianTebiTi efeqti mJRavndeba PDE4-is inhibirebiT (dou da sxv., 2005). ε-viniferini inhibitoria superoqsiduri anioniT lipidebis daJangvis procesisa (Saizu da sxv., 2004). vazis rqidan gamoyofili viniferini da rezveratroli xasiaTdebian apoptikuri da mJangavi efeqtiT qronikuli limfocitebis leikemiis dros (bailerdi da sxv., 2002). wiTeli Rvinidan gamoyofil viniferins ki, rezveratrolTan SedarebiT, Zlieri mainhibirebeli efeqti aRmoaCnda adamianis RviZlis mikrosomebis mimarT (bertrandi da sxv., 2003). Craistelis da TanaavtorTa mier (2002) dadginda vazidan gamoyofili viniferinis maRali antioqsidanturi aqtivoba rezveratrolTan, sinTezur 4-hidroqsistilbenTan, 4,4'-dihidroqsistilbenTan, 3,5-dihidroqsistilbenTan da trimeTilrezveratrolTan SedarebiT. ε-viniferinis mainhibirebeli efeqti, aseve gamovlenilia citoqrom $P_{450\text{-}Tan}$ mimarTebaSi (paiveri da sxv., 2003).

fenolmJavebi. Aaraflavonoiduri naerTebidan, wiTel yurZensa da RvinoSi, mniSvnelovan adgils ikavebs fenolmJavebi. erTmaneTisgan damoukideblad Catarebuli kvlevebis Sedegad yurZensa da RvinoebSi identificirebulia: galis, protokatexis, iasamnis, vanilinis, salicilis, p-kumaris, 4-oqsibenzois, ferulis, yavis, gentizinis da sxv. fenolmJavebi. (heningi da sxv., 1958; karli dasxv., 1960; ribero-gaioni, 1963).

Hharbornis da TanaavtorTa monacemebiT (1968), oqsidariCinis mJavebi Tavisufali saxiT mcire raodenobiTaa wiTel yurZensa da RvinoebSi. isini ufro metad gavrcelebulia eTerebis saxiT. mag. qlorogenis da izoqlorogenis mJavebi.

saferavis fenolmJavebi Tvisebrivad ganisazRvra jiSis gavrcelebis adgilis mixedviT kaxeTis raionebSi (qvliviZe da sxv., 2005). Ddafiqsirebul fenolmJavebs Soris dominantad gamovlinda iasamnis mJava. Aanalogiuri Sedegia miRebuli bardaveliZis da TanaavtorTa mier (2001) aleqsandroulis da mujureTulis yurZnis kanebSi da, aseve, maTgan damzadebul liqioruli tipis RvinoSi.

espanur wiTel RvinoebSi, romlebic damzadebuli iyo tempranilos, gracianos, kaberne sovinionis da merlotisgan, ganisazRvra fenolmJavaTa eTerebi: meTilgalati- 1,07–2,26 mg/l; eTilgalati 4,15–5,04 mg/l. trans-para-kumarmJavis heqsilis eTeri 0,2–0,37 mg/l (monagasi da

sxv., 2005). samxreT afrikis respublikaSi, kaberne sovinionis, pinos da Sirazis RvinoebSi aRmoCnda kaftarikis mJava (yavis da Rvinis mJavis eTeri), romelic Sesabamisad meryeobda gavrcelebis adgilis mixedviT, Semdeg farglebSi: 0,67–1,53, 2,22–66,36 da 0,62–1,42 mg/l (rosouvi da sxv., 2003).

dadgenilia, rom alkoholur duRilSi fenolaldehidebi, ZiriTadad, ganicdian aRdgeniT gardaqmnebs da Sedegad warmoqmnili aromatuli spirtebi bunebrivi saxiT rCebian moduRar areSi. gamonaklisia protokatexis aldehidi, romelic Znelad eqvemdebareba aRniSnul gardaqmnas. demeToqsilirebuli fenolmJavebi (galis, protokatexis, 4-oqsibenzois) alkoholur duRilSi gardaqmniT warmoqmnian cximovanmJavaTa eTilis eTerebs: eTilkapronats, eTilkaprinats, eTilkaprilats, eTillaurinats da sxv. vanilinis da iasamnis mJavebi gardaqmnebs ar eqvemdebarebian (nucubiZe da sxv. 1999).

cxrili 1.1

aRmosavleT saqarTvelos sxvadasxva raionis wiTelyurZniani jiSebis - saferavis, Tavkveris da asureTuli Savisagan damzadebuli liqioruli tipis RvinoebSi saerTo fenolebis raodenoba

yurZnis jiSis gavrcelebis adgili	**saerTo fenolebi gr/dm3**	**antocianebi mg/dm3**	**leikoantocian. mg/dm3**	**monom. fenolebi, mg/dm3**
saferavi				

gurjaani	**1,18**	**85,1**	**355**	**152**
yvareli	**1,2**	**92,2**	**363**	**162**
Telavi (kurdRelauri)	**1,11**	**76,2**	**332**	**144**
sagarejo (xaSmi)	**1,08**	**70,2**	**370**	**160**
Tavkveri				
kaspi	**0,93**	**67,1**	**285**	**140**
vaSlijvari	**0,90**	**58,8**	**288**	**128**
skra	**0,99**	**75,3**	**298**	**146**
asureTuli Savi				
vaSlijvari	**0,88**	**45,8**	**310**	**135**
asureTuli	**0,92**	**57,2**	**328**	**142**

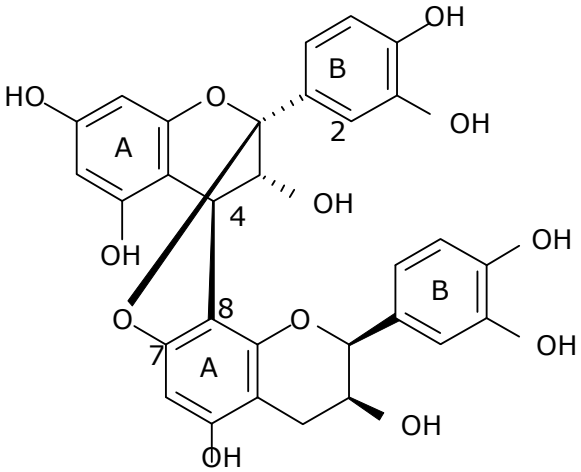
fenolmJavebi amJRavneben biologiur aqtivobebs, maT Soris antioqsidantur aqtivobas. Mmag. beJuaSvilis da TanaavtorTa mier (2008), ganisazRvra Rvinis fenolmJavebis antioqsidanturi aqtivoba «in vitro». cdebSi, adamianis sisxlSi malondialdehidis warmoqmnis inhibirebis xarisxis mixedviT. Aantioqsidanturi aqtivobis mixedviT 95-40% intervalSi gamovlinda fenolmJavebis Semdegi Tanmimdevroba: galis > protokatexis > gentizinis > yavis > ferulis > π-kumaris > 4-oqsibenzois > salicilis > iasamnis. vanilinis mJavas aRmoaCnda negatiuri korelacia, anu nulis toli antioqsidanturi aqtivoba.

Fflavonoiduri naerTebi

bioflavonoidebi mcenareul qsovilSi farTod gavrcelebuli nivTierebebia. vazis flavonoidebis mdidari speqtri warmodgenilia proantocianidinebis, antocianebis, flavanolebis, flavonolebis, flavononebis da sxv. jgufebis komponentebiT. (durmiSiZe, 1950, 1951, 1955, 1961, 1965; valuiko, 1973; rodopulo, 1971). es nivTierebebi aqtiur monawileobas iReben Rvinis organoleptikuri da xarisxobrivi maCveneblebis formirebaSi. amasTan, maRali biologiuri aqtivobiT xasiaTdebian da saerTo fenoluri nivTierebebis wiliT gansazRvraven Rvinis samkurnalo-kvebiT Rirebulebas.

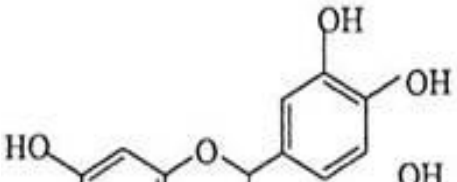
Pproantocianidinebi. (flavan-3,4-diolebi). maTi yvelaze gavrcelebuli warmomadgenelia leikocianidini, leikodelfinidini da leikopelargonidini. saferavis yurZnis magari nawilebidan, leikoantocianidinebi didi raodenobiTaa yurZnis wipwaSi 290,3mg/g (sofromaZe, 1974, javaxiSvili, 2006). gavrcelebuliaPproantocianidinebis dimeruli, trimeruli, tetrameruli da polimeruli formebi. Ppolimeruli formebi tanins warmoadgens. Ooligomerul proantocianidinebs

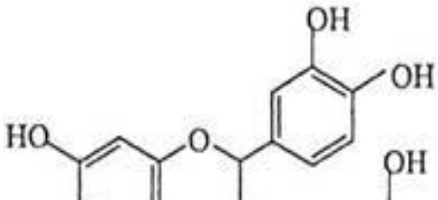
Soris dominirebs dimeruli formebi. Pproantocianidin - A_1 warmoadgens epigalokateqin-epikateqinis dimers; proantocianidin - A_2 aris katexin-katexinis dimeri. rac Seexeba B tipis dimerebs, maTi qimiuri Sedgeniloba warmodgenilia cxrilis saxiT.



Pproantocianidini - A_2

dimerebi	Sedgeniloba	R_1	R_2	R_3	R_4
B_1	epikatexini-(4®□8)-katexini	H	OH	OH	H
B_2	epikatexini -(4®□8)- epikatexini	H	OH	H	OH
B_3	katexini -(4〈□8)- katexini	OH	H	OH	H
B_4	katexini -(4〈□8)- epikatexini	OH	H	H	OH
B_5	epikatexini -(4®□6)- epikatexini	H	OH	H	OH
B_6	katexini -(4〈□6)- katexini	OH	H	OH	H
B_7	epikatexini -(4®□6)- katexini	H	OH	OH	H
B_8	katexini -(4〈□6)- epikatexini	OH	H	H	OH



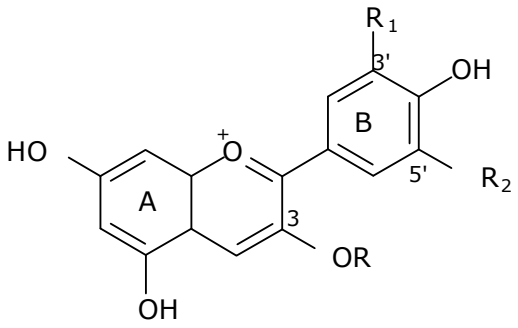


procianidini B 1: R' = OH, R = H **procianidini B2: R = H, R = OH**
procianidini B3: R' = OH, R = H **procianidini B4: R = H, R – OH**

oligomeruli proantocianidinebi wyalSi kargad xsnadi nivTierebebia. mJava da tute areebSi ganicdian hidrolizs. Aalkoholuri duRilis procesSi intensiurad gamoiwvlilebian durdodan da lokalizirdebian RvinomasalaSi. Ddadgenilia, rom teqnikuri wiTelyurZniani vazis jiSebidan damzadebul wiTel RvinoebSi oligomeruli proantocianidinebi mniSvnelovnad naklebia polimerul proantocianidinebze, xolo pirdapirmwarmoebeli hibriduli formebidan damzadebul RvinoebSi ki - piriqiT (beJuaSvili da sxv. 2008)

proantocianidinebis fiziologiuri aqtivoba dadasturebulia rigi gamokvlevebiT. isini xasiaTdebian antioqsidanturi da kardioproteqtoruli aqtivobiT (sato da sxv., 2004); wiTeli Rvinis proantocianidinebis inhibitoruli moqmedeba lipoproteinebis oqsidaciaze dadgenilia qeris da Tanaavtoris mier (1997). wiTeli Rvinis flavonoidebis aqtivoba PDGF receptoris mimarT, gamovlenilia rozenkranzis da TanaavtorTa mier (2002); wiTeli Rvinis proantocianidinebi dadebiT gavlenas axdenen vaskularul daavadebebze (korderi da sxv., 2006). procianidinebis inhibitoruli moqmedeba, aseve, dadasturebulia zogierTi fermentis mimarT (aqtis-goreta da sxv., 2003).

antocianebi. yurZnis wiTel pigmentebs antocianebi (antocianidinebis glikozidebi) warmoadgens. teqnikuri vazis jiSebis yurZensa da RvinoSi ZiriTadad gavrcelebulia malvidinis, delfinidinis, peonidinis, pelargonidinis da cianidinis monoglukozidebi. maT Soris dominantia malvidinis monoglukozidi. yurZnis da Rvinis antocianebis SeswavlaSi didi wvlili Seitanes sxvadasxva qveynis mkvlevarebma, romelTa Soris unda aRiniSnos baton s. durmiSiZis mecnieruli xelmZRvanelobiT Catarebuli gamokvlevebis mniSvneloba (durmiSiZe, 1955; ribero-gaioni 1957,1959,1968). garda glikozidebisa, antocianebi gvxvdeba aseve acilirebuli formebis saxiTac, sadac mJavebidan dafiqsirebulia: para-kumaris, 4-oqsibenzois, yavis, qlorogenis mJavebi (ribero-gaioni, 1959; samaatmaja da sxv.,1963).



Aantocianidinis R*=H	R1	R2
malvidini	**OCH_3**	**OCH_3**
peonidini	**OCH_3**	**H**
delfinidini	**OH**	**OH**
petunidini	**OCH_3**	**OH**
cianidini	**OH**	**H**

wiTelyurZniani teqnikuri vazis jiSebisTvis da, Sesabamisad, maTgan damzadebuli wiTeli RvinoebisTvis kanonzomieria antocianebs Soris malvidinis monoglukozidis dominanti

raodenobiT Semcveloba. Ppirdapirmwarmoebeli hibriduli formebisTvis ki, antocianebs Soris, wamyvania malvidinis diglukozidi.

es kanonzomiereba naTlad aisaxeba saqarTveloSi gavrcelebuli wiTelyurZniani vazis jiSebis yurZnis kanis da wiTeli Rvinoebis antocianebis qromatografiul profilSi (beJuaSvili da sxv., 2009; qvliviZe da sxv., 2005). Tumca, unda aRiniSnos, rom zogierTi teqnikuri jiSi garkveuli raodenobiT Seicavs diglikoziduri formebis antocianebs, mag. asureTuli Savi (beJuaSvili da sxv., 2007). Aantocianebis Tvisebrivi speqtri, sxva maCveneblebTan erTad, wiTel RvinoebSi jiSuri siwmindis dadgenis safuZvels warmoadgens (beJuaSvili das xv., 2007).

antocianebis gamokvleva gansakuTrebiT mniSvnelovania wiTeli da vardisferi Rvinoebis xarisxobrivi SefasebisaTvis. aqedan gamomdinare, es sakiTxi yovelTvis imsaxurebs avtorTa yuradRebas. beJuaSvilis da qvliviZis mier (2005) gamokvleulia kaxeTis raionebSi gavrcelebuli saferavis yurZnis kanis da rbilobis, aseve, Sesabamisi sufris mSrali Rvinomasalebis saRebavi nivTierebebi. kvlevis Sedegebi mocemulia cxrilebis saxiT:

cxrili 1.2

saRebavi nivTierebebis Semcveloba kaxeTis sxvadasxva raionSi gavrcelebul vazis jiS saferavis yurZnis kansa da rbilobSi

raionebi	**saRebavi nivTierebebi**	
	kani, %	**rbilobi, mg/l**
xaSmi	5,80	116,00
siRnaRi (sof, anaga)	5,30	230,00
gurjaani (sof. bakurcixe)	5,50	100,00
Telavi (sof. Qqv. xodaSeni)	4,50	105,70
axmeta (sof. qistauri)	4,50	63,40
yvareli	5,00	120,00
lagodexi (sof. baisubani)	5,30	120,00

cxrili 1.3

saRebavi nivTierebebis Semcveloba kaxeTis sxvadasxva raionSi gavrcelebul vazis jiS saferavisgan damzadebul sufris mSral RvinomasalebSi (mg/l)

raionebi	saRebavi nivTierebebi, mg/l	
	6 Tviani	9 Tviani
xaSmi	741,70	587,50
siRnaRi (sof, anaga)	643,70	643,00
gurjaani (sof. bakurcixe)	722,40	700,00
Telavi (sof. Qqv. xodaSeni)	533,30	475,00
axmeta (sof. qistauri)	583,00	525,00
yvareli	643,00	643,00
lagodexi (sof. baisubani)	682,80	675,00

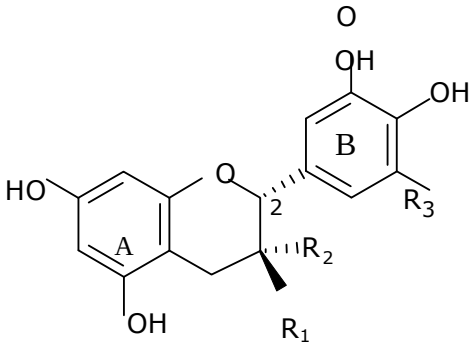
antocianTa teqnologiuri maragi saqarTveloSi gavrcelebul wiTelyurZnian jiSebSi ebelaSvilis monacemebiT (2006) Semdegia: saferavis yurZenSi (sagarejos, gurajaanis, Telavis, yvarlis r-Si) 2100-2340 mg/dm^3; Tavkveris yurZenSi (vaSlijvari, skra) 760-875 mg/dm^3; asureTuli Savi (sof. asureTi, vaSlijvari) 630-540 mg/dm^3; Savkapito (skra) – 572 mg/dm^3. antocianTa kompleqsis warmoqmna sxva fenolur naerTebTan did interess iwvevs mkvlevarTa Soris. tanin-antocianebis kompleqsis warmoqmna wiTel RvinoebSi Seswavlilia mravali mecnieris mier (valuiko, 1973; katania, 2006; gloresi, 1984; hoSino da sxv. 1980). tanin-antocianuri kompleqsi xasiaTdeba muqi lalisferi SeferviT da STanTqmis maqsimumia 520-530 nm. aRniSnuli kompleqsis warmoqmna dadgenilia, aseve, somersis gamokvlevebiT (1966; 1967). antocianebi kompleqsur naerTebs warmoqmnian, aseve, katexinebTan, dimerul da trimerul proantocianebTan, romelsac adasturebs timberlakis gamokvlevebi (1976). kaxeTSi gavrcelebuli saferavis kvlevebma gamoavlina xaSmis saferavis Tavisebureba. igi gamoixateba sufris mSrali Rvinis cxraTvian davargebaSi antocianebis Tavisufali formebis gaqrobiT da feris intensivobis SenarCunebiT, rac aixsneba xsnadi da Seferili proantocianidur-antocianuri kompleqsis warmoqmniTQ(qvliviZe, 2005). wiTeli yurZnis kanis da axalgazrda Rvinis Sefervis intensivobas ganapirobebs antocianTa glikoziduri formebi da acilirebuli nawarmebi. Rvinis daZvelebasTan erTad es formebi mcirdeba, rac iwvevs feris intensivobis Secvlas. antocianTa cvlileba gamowveulia maTi daJangviT, polimerizaciis da kondensaciis reaqciebSi monawileobiT, fenolis naerTebTan da metalebTan urTierTqmedebis Sedegad kompleqsuri

naerTebis warmoqmniT. daZvelebuli Rvinis warmoqmnas, ZiriTadad, ganapirobebs antocianTa kompleqsuri formebi (gareki da sxv. 1965). ribero-gaionis gamokvlevebiT (1965, 1968),s frangul daZvelebul wiTel RvinoebSi antocianTa individualuri formebi qreba da Rvinis Sefervas ganapirobebs antocianTa kondensaciis, polimerizaciis da hidrolizis produqtebi. saferavisagan damzadebuli sufris mSrali Rvino, romelic inaxeba boTlebSi gansxvavebuli hermetulobis da temperaturis pirobebSi, kargavs Tavisufal da kompleqsur antocianebs maTi gamoleqvis Sedegad. gamoleqvis procesi intensiuria acetaldehid-ZmarmJavis momatebuli raodenobis pirobebSi (beJuaSvili, CxartiSvili, 2004). antocianebis feris intensivobaze gavlenas axdens Semdegi faqtorebi: pH, temperatura, fermentaciuli procesi; sinaTle, Jangbadi, struqtura, koncentracia da antocianTa kopigmentacia. kopigmentaciuri formebi wiTel RvinoebSi Sefervis intensivobis stabilurobiT xasiaTdeba (aseni da sxv. 1972; 1975; broilardi, 1983; laieo da sxv. 1992; broilardi da dangleri, 1994; Yabya da sxv. 1997).

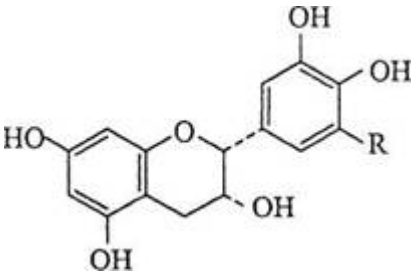
antocianebi wiTeli RvinisTvis mniSvnelovania aramarto Sefervis intensivobis TvalsazrisiT, aramed misi samkurnalo-profilaqtikuri kuTxiTac. cianidinis da cianidin-3-glukozidis antioqsidanturi da proteqtoruli aqtivoba dadgenilia acquavivas da sxv. mier (2003). antocianebis Semcveli eqstraqtis antioqsidanturi aqtivoba gamovlenilia gabrielskas da sxv. mier (1999). beJuaSvilis da TanaavtorTa mier (2005) gamokvleulia antocianebis – malvidinis, peonidinis, petunidinis da delfinidinis monoglukozidebis antioqsidanturi aqtivoba pH-ze damokidebulebiT. kerZod, pH 2,5-3,0 intervalSi antioqsidanturi aqtivoba klebulobs 95%-dan 85%-mde; pH 3,0-4,0 intervalSi ar icvleba da Seadgens 85%, xolo pH 4,0-5,0 aqtivoba kvlav izrdeba.

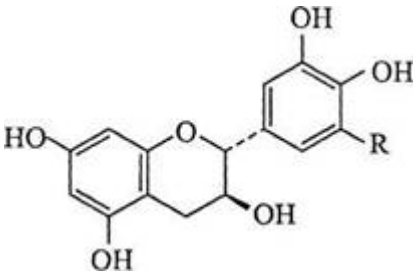
Fflavonolebi. yurZnis da Rvinis flavonolebi ZiriTadad warmodgenilia glikozidebis saxiT, romelTa aglikonebia kvercetini, miricetini, kempferoli. Mmkvlevarebis monacemebiT feradyurZniani jiSebi da maTgan damzadebuli Rvinoebi, TeTrTan SedarebiT, met flavonolebs Seicavs. sxvadasxva qveyanaSiKkaberne sovinionidan damzadebul wiTel RvinoebSi dafiqsirebulia flavonolebi: kvercetini: avstraliurSi 1,59-1,73 mg/100 ml; frangulSi 0,69-1,24 mg/100ml; espanurSi 0,76 mg/100ml; CileSi damzadebulSi 1,77 mg/100ml; Ciles merlotSi 1,28mg/100 ml; frangul merlotSi 1,41 mg/100ml (iusteseni da sxv., 1998) berTelis da TanaavtorTa mier (1998), Seswavlilia kvercetinis, kempferolis, miricetinis, apigeninis da luTeolinis gavlena adamianTa organizmze. kerZod, dadginda maTi roli gulis koronaruli daavadebebiT gamowveuli sikvdilis riskis Tavidan acilebaSi. Fflavonolebis, flavonebis da antocianebis antioqsidanturi aqtivoba, kibos da miokardis infarqtis mimarT samkurnalo-profilaqtikuri moqmedeba dadgenilia boomis da Tanaavtora mier (1998); kvercetinis da silibininis damcavi efeqti ujredze da qsovilze Jangbadis mavne moqmedebebisgan dadgenilia grootis mier (1998).

Fflavan-3-olebi (kateqinebi) yurZensa da RvinoSi farTod gavrcelebuli flavonoidebis jgufia. individualuri saxiT, ZiriTadad, gvxvdeba cxrilis saxiT warmodgenili kateqinebi.



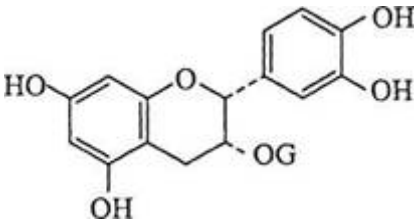
flavanolebi	R_3	R_1	R_2
(+)-kateqini	**H**	**OH**	**H**
(-)-epikatexini	**H**	**H**	**OH**
(+)-galokatexini	**OH**	**OH**	**H**
(-)-epigalokatexini	**OH**	**H**	**OH**





R - H: (+) - kateqini
R = OH: (+) - galokateqini

R = H: (-)-epikateqini
R = OH: (-) – epigalokateqini



epikateqin -3- galati
G = galis mJava

1.2. wiTeli Rvinis samkurnalo-profilaqtikuri Tvisebebi

2002 wlis oqtomberSi CileSi Catarda saerTaSoriso konferencia Temaze "Rvino da janmrTeloba". konferenciaze warmodgenili samecniero kvlevebis Sedegebi Seexeboda Rvinis Semadgeneli fenoluri naerTebis da TviT Rvinis samkurnalo Tvisebebs.

mecnier mixail avimaris kvlevis SedegebiT dadginda wiTeli Rvinis flavonoidebis – bunebrivi antioqsidantebis – mier dabali simkvrivis lipoproteinebis daJangvis inhibireba. es nivTierebebi aTerosklerozis, gulsisxlZarRvTa dazianebis da Trombis warmoqmnis ZiriTad mizezs warmoadgens. unda aRiniSnos, rom wiTeli Rvino amcirebs sisxlSi fibrinogens da zrdis fibrinolizs. es ki, Tavis mxriv, amcirebs Trombis sacobis warmoqmnis albaTobas da xels uwyobs koronarul arteriebSi am sacobis gaxsnas, amave arteriebSi amcirebs spazmebs stresis dros da zrdis sisxlis miwodebas. Tagvebze Catarebuli eqsperimentiT, rodesac cdis obieqtebi wiTeli Rvinis moqmedebis qveS imyofebodnen, dabali simkvrivis lipoproteinebis daJangva 45 %-iT Semcirda. flavonoidebi avlenen antioqsidantobas Tavisufali radikalebis oqsidaciis saxiT. flavonoidebi (0,5 g /dReSi) nawlavebSi iwvevs antioqsidantur efeqts, romelic 5-10-jer ufro maRalia vidre C da E vitaminebis antioqsidanturi efeqti. kvlevebiT dadasturda, rom wiTeli Rvino da flavonoidebi mniSvnelovnad amcireben Wamis Semdgom JangviT stress sisxlZarRvebis SigniT, _ aseTi daskvna gaakeTa Bbuenos- airesis universitetis mkvlevarma boveirim.

adamianis janmrTelobasTan dakavSirebiT wiTeli Rvinis intensiuri kvleva e. w. "franguli paradoqsis" warmoCenis Semdeg daiwyo. safrangeTSi, sadac bevrs ewevian, aqvT sisxlis maRali wneva, miirTmeven cximian sakvebs da qolesteriniT mdidar xorcs, gulis koronaruli daavadebis Zalian dabali maCvenebelia. am fenomenis gamokvleviT mividnen daskvnamde, rom, swored, wiTeli Rvino icavs guls daavadebisagan da gulis infarqtiT adamianTa nakleb sikvdilianobas ganapirobebs.

harvardis universitetis mkvlevarebma aRmoaCines, rom Rvinis moxmareba 39 %-iT amcirebs TirkmelSi kenWis warmoqmnis risks. gamokvlevebiT dadginda, rom mamakacebi, romlebic zomierad moixmaren Rvinos, gacilebiT naklebad avaddebian diabetiT, vidre aramsmelebi. Rvino dadebiTad moqmedebs adamianTa saxsrebis funqciaze: msmelebis saxsrebi saukeTeso mineraluri gamtarobiT xasiaTdeba, rac potenciurad amcirebs osteoqondrozis risks. italieli mkvlevarebis mier dadginda, rom Rvinis zoemieri moxmareba saSarde buStis daavadebebis risks 20%-iT amcirebs.

80-ian wlebSi mimdinareobda dakvirveba sami tipis sasmelze: Rvino, ludi da spirti. eqsperimentis Sedegad gamovlinda, rom Rvinis zomieri gamoyeneba amcirebs kardiovaskularuli da cerebrovaskularuli daavadebebiT gamowveul sikvdilis risks. spirtis analogiuri gamoyeneba zrdis am risks, maSin rodesac ludis moxmareba ar iwvevs sikvdilianobas (gronbeiki da sxv.,

1995). pacientebis mkurnalobas awarmoebdnen qiSmiSiT, yurZnis wveniT da mSrali wiTeli RviniT. aRmoCnda, rom saukeTeso fsiqofizikuri mdgomareoba miRweul iqna wiTeli Rvinoebis gamoyenebisas (demrovi da sxv., 1995; dutovi da sxva 1998).

unda aRiniSnos, rom adamianis organizmis dabali simkvrivis lipoproteinebSi maRali antioqsidanturi aqtivoba gamovlenilia wiTeli Rvinis da ara feradi yurZnis wvenis miRebisas. es niSnavs, rom wiTeli Rvinis flavonoidebi ufro advilad adsorbirdebian saWmlis momnelebel sistemaSi, vidre yurZnis wvenidan (blondi da sxv., 1995).

ukanaskneli wlebis ganmavlobaSi damajereblad dadginda, rom wiTeli Rvinis biologiuri aqtivoba, ZiriTadad, ganpirobebulia misi Semadgeneli fenoluri naerTebiT, romlebic boWaven Tavisufal radikalebs da warmoadgenen antioqsidantebs, icaven qolesterols daJangvisagan. es ukanaskneli ki gulis infarqtis ZiriTad mizezadaa aRiarebuli. mkvlevarTa jgufis (broilardi da sxv., 1997) mizani iyo daedginaT, rogor icvleboda wiTeli Rvinis daZvelebis Sedegad misi fenoluri naerTebis antioqsidanturi Tvisebebi TviT ferad yurZenSi arsebul fenolur naerTebTan SedarebiT. eqsperimentis Sedegad gamovlinda sxvaoba, magram isic naTelia, rom yurZenic dadebiTad moqmedebis adamianis janmrTelobaze.

1986-89 wlebSi Crdilo-aRmosavleT safrangeTSi Catarda gamokvleva wiTeli Rvinis gavlenis dasadgenad mkerdis simsivneze (vili da sxv., 1997). aRmoCnda, rom mkerdis kibos riski wiTeli Rvinis miRebisas (TveSi 4 l) SeizRuda.

profesor elisonis azriT, wiTeli Rvino Seicavs 500-mde samkurnalo nivTierebas. amasTan, Zalian gawmendili da gafiltruli Rvinoebi kargaven Tavis faseul Rirsebas. Aamave dros, upiratesad aRsaniSnavia arteriebis damcveli antioqsidantebi. gansakuTrebuli yuradReba eqceva wiTeli Rvinoebis flavonoidebs, romlebic maRali antioqsidanturi aqtivobiT gamoirCevian da icaven lipoproteinebs daJangvisagan. Ees ukanaskneli warmoadgens sisxlZarRvebis dazianebis da Trombis warmoqmnis ZiriTad mizezs. wiTeli Rvinis efeqti – Seamciros adamianebSi infarqtis riski da Trombis warmoqmnisaken sisxlis tendencia – mniSvnelovnad ganpirobebulia stilbenuri tipis monomeruli nivTierebis – rezveratrolis – biologiuri aqtivobiT.

doqtor martin gronbukis azriT ki, “Rvinis moxmarebis TvalsazrisiT “fxizlebSi” sikvdilis riski 2-jer metia, vidre maTSi, vinc yoveldRiurad svams Rvinos. gangvacvifra imis aRmoCenam, rom yoveldRiurad 3-dan 5 Wiqamde Rvinis miReba mniSvnelovnad amcirebs adamianTa sikvdilianobas”.

bolo wlebis samecniero naSromebiT dadginda: yoveldRiurad 200-300 ml wiTeli Rvinis miReba janmrTeli mamakacebisaTvis da 100-200 ml – janmrTeli qalebisaTvis. es raodenoba SeiZleba miRebul iqnas rogorc samedicino, ise socialur normad (lugasi da sxv., 1997; kondo da sxv., 1994; de riJke da sxv., 1995; frankeli 1993).

2. e **q s p e r i m e n t u l i n a w i l i**

2.1. kvlevis obieqtebi da meTodebi

obieqtebi: a) yurZnis kanebi. kvlevis obieqtebad gamoyenebuli gvqonda saqarTveloSi gavrcelebuli vazis wiTelyurZniani jiSebi: saferavi (kardenaxi, axaSeni, qinZmarauli, winandali, nafareuli), saferavi budeSurisebri, kaberne-sovinioni (winandali), ocxanuri safere (zestafoni), ojaleSi (martvili), aladasturi (ozurgeTi), Cxaveri (ozurgeTi), aleqsandrouli (ambrolauri), mujureTuli (ambrolauri), asureTuli Savi (asureTi). eqsperimenti CavatareT aRniSnuli jiSebis yurZnis kanze da Rvinoebze. amasTan, saferavi aRebuli gvqonda Semdegi gavrcelebis adgilis mixedviT**: axaSeni (fafris veli), kardenaxi (axoebi), qinZmarauli, winandali da nafareuli.**

b) Rvinomasalebi. saeqsperimento Rvinomasalebi davamzadeT klasikuri teqnologiis mixedviT 2009 wlis mosavlidan "Rvinis kompania Sumis" qarxanaSi. kerZod: saferavi (winandali) _ sufris mSrali; saferavi (axaSeni) _ bunebrivad naxevradtkbili; saferavi (qinZmarauli) _ bunebrivad naxevradtkbili; saferavi (kardenaxi) _ sufris mSrali; kaberne-sovinioni _ sufris mSrali; ojaleSi _ bunebrivad naxevradtkbili; aladasturi _ sufris mSrali; Cxaveri _ mSrali bunebrivad naxevradvardisferi; asureTuli Savi _ sufris mSrali; aleqsandrouli _ bunebrivad naxevradtkbili; mujureTuli _ bunebrivad naxevradtkbili;

postfermentuli maceraciiT davamzadeT sufris mSrali Rvinoebi winandlis saferavisa da kaberne-sovinionis 2010 wlis mosavlisagan.

g). Sps "Rvinis kompania SumSi" klasikuri teqnologiiT damzadebuli wiTeli Rvinoebi:

"mukuzani"_mSrali (saferavi,2010w);

"Sumi"_ mSrali (saferavi:kaberne 75%:25%, 2010);

"qarTuli nadimi"_ mSrali (saferavi,2010w.);

"bioRvino" _ mSrali (winandlis saferavi,2008);

“qinZmarauli”_ bunebrivad naxevradtkbili (saferavi,2010);

“xvanWkara” _ bunebrivad naxevradtkbili (aleqsandrouli + mujureTuli, 2010);

“Sumi”_ bunebrivad naxevradtkbili (saferavi:kaberne 75%:25% .2010w);

“qarTuli nadimi”_ bunebrivad naxevradtkbili (saferavi, 2010);

“alaznis veli”_ bunebrivad naxevradtkbili (saferavi, 2010);

gansazRvris meTodebi.

a) ε-viniferinis da sxva stilbenebis Semcveli fraqciis gamoyofa da Txelfenovani qromatografia. yurZnis kanSi ε-viniferinis identifikaciis da raodenobrivi gansazRvris mizniT, obieqtebi gavaSreT haerze, davaqucmaceT da srulad gamovwvlileT eTilacetatiT cxel pirobebSi. eTilacetatiani fraqcia gavasufTaveT “sefadeqs G 25”_ze da gamoviyeneT Tvisebrivi analizisTvis, romelic CavatareT Txelfenovani qromatografiis meTodiT silufolis firfitaze (20/20sm) sistemaSi – qloroformi : meTanoli (80:20), qromatogramebi gavamJRavneT diazotirebuli sulfanilis mJaviT. Aaseve, CavatareT ε-viniferinis Tvisebrivi analizi saeqsperimento RvinoebSi maTgan gamowvlilul eTilacetatian fraqciebSi.

b) ε-viniferinis, tetrameruli stilbenis da trans-rezveratrolis raodenobrivi gansazRvra maRalefeqturi siTxuri qromatografiiT. raodenobrivi gansazRvrisTvis gamoviyeneT kvlevis obieqtebidan miRebuli stilbenebSemcveli fraqciebi da maRalefeqturi siTxuri qromatografiis meTodiT CavatareT raodenobrivi gansazRvra (Guebailia et al.,2006) **qromatografi _ ”Varian”, sveti _ Mikrosorb 100 C18, 250X4,6 LXId(mm); A: 0,025% triftorZmarmJava; B: acetonitrili (ACN)/A, 80/20. gansazRvra Catarda gradientis reJimSi:**

0_35wT 20_50%;

B35_40 wT 50_100%; B

41_46 wT 100%;

46_48wT 100_20% B

48_53wT 20%. B

qromatografiuli gansazRvra Catarda mevenaxeobis, meRvineobis da mebaReobis institutis centralur laboratoriaSi.

garda siTxuri qromatografiisa, eqsperimentis msvlelobisas RvinoebSi ε-viniferiniს, trans-rezveratrolis da tetrameruli stilbenis raodenobrivi gansazRvrisTvis gamoviyeneT arsebuli speqtrofotometruli meTodebi, risTvisac nimuSebidan winaswar vaxdendiT saZiebeli naerTebis preparatul gamoyofas silufolis firfitebidan (beJuaSvili, 1994; beJuaSvili da sxv. 2005).

eqsperimentis msvlelobisas Sesadareblad gamoviyeneT vazidan individualuri saxiT gamoyofili ε-viniferini, trans-rezveratroli da tetrameruli stilbeni.

ბ) vaSl-rZemJava duRili CavatareT saferavisgan damzadebul sufris mSral RvinomasalaSi trans-rezveratrolis da ε ε-viniferinis damatebiT da bunebrivad - maTi Setanis gareSe. duRili vawarmoeT rZemJava baqteriebis mSrali preparatiT "inoflor R"-iT. modeluri vaSl-rZemJava duRili, aseve, CavatareT igive preparatiT da Semdegi flavonoidebis - kvercetini, (+) katexini, (-) epikatexini – da fenolkarbonmJavebis - yavis da ferulis mJavebis - TanaobiT. rZemJavis warmoqmnas vakvirdebodiT Tvisebrivad, qaRaldis qromatografiis meTodiT.

d) organuli mJavebiს gansazRvra maRalefeqturi siTxuri qromatografiiT. Oorganuli mJavebi raodenobrivad ganvsazRvreT siTxuri qromatografiis meTodiT Semdeg pirobebSi: **qromatografi- "Varian", sveti- Supelsol C 18-DB, 25cmx4,6mm; eluentebi: A-0,1% H_3PO4 +1%meTanoli; B-meTanoli; gradientuli reJimi B eluentis mixedviT. analizis xangrZlivoba 15wT. deteqtireba UV/Vis deteqtoriT 215 nm talRis sigrZeze.**

e) saerTo fenolebi ganvsazRvreT folin-Cokalteus reaqtivis gamoyenebiT speqtrofotometrulad; **kateqinebi da polimeruli proantocianidinebi** ganvsazRvreT eTilacetatiani fraqciebidan, Sesabamisad, vanilinis reaqtivis gamoyenebiT, speqtrofotometrulad, polimeruli proantocianidinebi ki _ SemJavebuli buTanolis damatebis Semdeg 40 wT-iani gacxelebiT, speqtrofotometrulad. **saerTo saRebavebi** ganvsazRvreT speqtrofotometrulad (valuiko, 1973). saeqsperimento Rvinoebis **alkoholis, mqrolavi mJavianobis, titruli mJavianobis, eqstraqtis** gansazRvras vatarebdiT moqmedi normatiuli dokumentaciis Sesabamisad.

v) Rvinoebis antioqsidanturi aqtivoba davadgineT eleqtronuli paramagnituri rezonansuli **(epmr)** meTodis gamoyenebiT. (Gardner P.T., 1998), romliTac izomeba wiTeli Rvinis antioqsidanturi potenciali _ unari SeboWos fremis marilis radikalebi. Aamzadeben Rvinis 5%_ian xsnars eTanoli/wylis (12:88 v/v) narevSi. xsnaris 3 ml reagirebs imave moculobis 1 mM fremis marilis **$(KSO_3)_2NO$** xsnarTan. fremis radikali dabal rezonansul velebSi izomeba reaqciis dawyebidan 15_20 wuTis Semdeg _ rodesac reaqcia mTavrdeba. koncentracias iTvlian sakontrolo reaqciiT wiTeli Rvinis gareSe _ fremis marili + eTanoli/wyali 12/88 v/v 21 ^{0} C temperaturaze. gansazRvra Catarda iv. javaxiSvilis sax. Tbilisis saxelmwifo universitetSi.

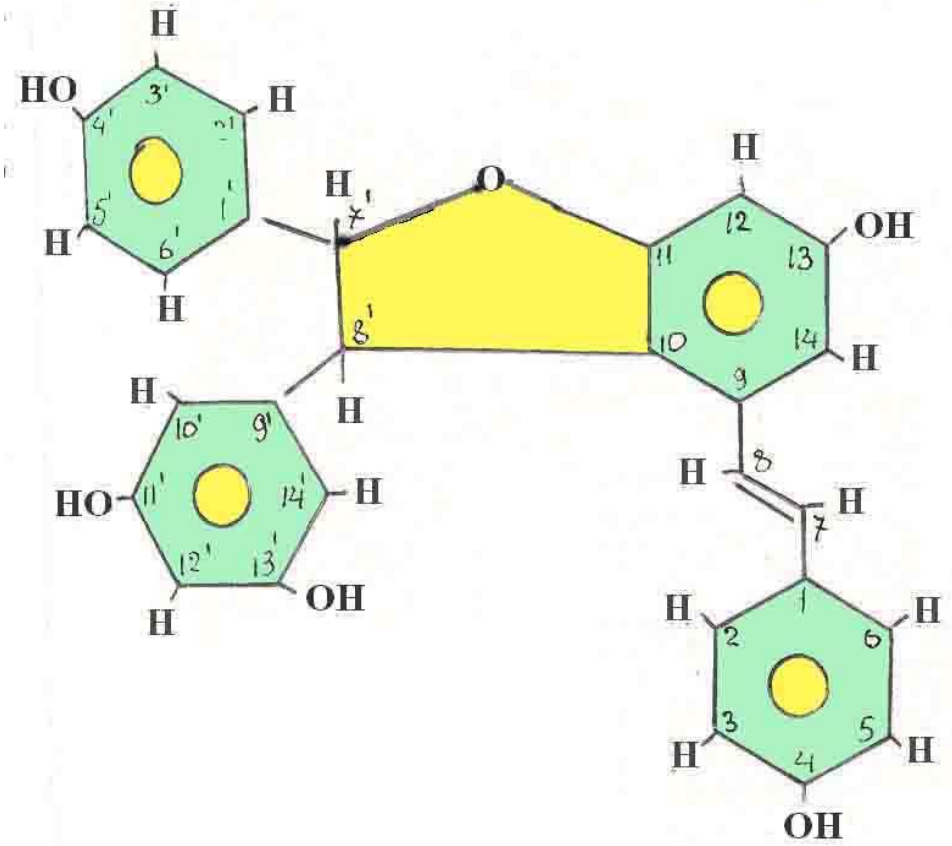
z) wiTeli Rvinoebis fenolur naerTTa koncentraciasa da maT antioqsidantur aqtivobas Soris damokidebulebis **ganzogadebis safuZvelze** SevadgineT Rvinomasalis antioqsidanturi Rirebulebis ganmsazRvreli miznobrivi funqciis zogadi maTematikuri modeli.

2.2. ε-viniferinis identifikacia vazis wiTelyurZnian jiSebSi

dasaxuli kvlevis Casatareblad, upirveles yovlisa, mizanSewonilad miviCnieT saZiebeli nivTierebis identificireba saeqsperimento nimuSebSi _ saqarTveloSi gavrcelebuli

wiTelyurZniani vazis jiSebis yurZnis kanSi. amisaTvis yurZnis kanebi gavaSreT haerze, davaqucmaceT, movaTavseT mrgvalZira kolbSi, davamateT 1:10 SefardebiT eTilacetati da CavatareT cxeli eqstraqcia 30 wT-is ganmavlobaSi ukumacivris TanaobiT. Pprocesi gavimeoreT 3-jer da miRebuli eTilacetatiani fraqciebi SevaerTeT. Semdeg davakoncentrireT rotaciul gadamdenze 40^0C temperaturaze da stilbenebSemcveli sufTa preparatis misaRebad davamuSaveT sefadeqsze. eluentad gamoyenebuli gvqonda narevi _ meTanoli : wyali (60:40). miRebuli gasufTavebuli fraqcia kvlav davakoncentrireT da gamoviyeneT saanalizod. aRniSnulis analogiurad davamuSaveT yvela sacdeli nimuSi da maTi Txelfenovani qromatografia CavatareT silufolis firfitebze sistemaSi _ qloroformi : meTanoli (80:20). Qqromatogramebi gavamJRavneT diazotirebuli sulfanilis mJaviT.

qromatografiuli monacemebis mixedviT, saeqsperimento wiTelyurZniani vazis jiSebis stilbenebSemcveli jamuri preparatebi aRmoCnda sakmaod mravalferovani. (sur. 2.2.1) individualuri ε-viniferinis Sesabamisi nivTiereba, misTvis damaxasiaTebeli laqis saxiT da mdebareobiT, yvela sacdel nimuSSi dafiqsirda. individualuri ε-viniferinis da saZiebeli nivTierebis ganawilebis koeficienti **Rf** erTi da igive sidide - 0,67 aRmoCnda. gamJRavnebis Semdeg ki orive laqa Seifera moyviTalo-yavisfrad. Uunda aRvniSnoT, rom qromatogramebs vakvirdebodiT ultraiisferi sxivebis fonze, sadac SeiniSneboda individualuri ε-viniferinis da saZiebeli nivTierebis molurjo-moiisfro naTeba. Semdeg yurZnis kanebis stilbenSemcveli jamuri preparatebidan preparatulad, individualuri saxiT, gamovyaviT saZiebeli nivTiereba da ultraiisfer ubanSi davadgineT TiToeuli maTganis STanTqmis maqsimumi. Ees dafiqsirda 300-310 nm talRis sigrZeze. analogiuri maCvenebeli aRmoaCnda individualur ε-viniferins. zemoaRniSnuli monacemebi miTiTebulia cxr. 2.2.1



ε-viniferini

$C_{28}H_{24}O_6$

sur. 2.2.1 wiTelyurZniani vazis jiSebis yurZnis kanis stilbenSemcveli fraqciis Txelfenovani qromatograma. sistema: qloroformi : meTanoli _ 80 : `20; gamamJRavnebeli diazotirebuli sulfanilis mJava

1 – saferavi (axaSeni), 2 – saferavi budeSurisebri, 3 - kaberne sovinioni, 4 - ocxanuri safere, 5 – Cxaveri, 6 – ojaleSi, 7 – aladasturi, 8 – aleqsandrouli, 9 – mujureTuli, 11 – asureTuli Savi.

cxrili 2.2.1

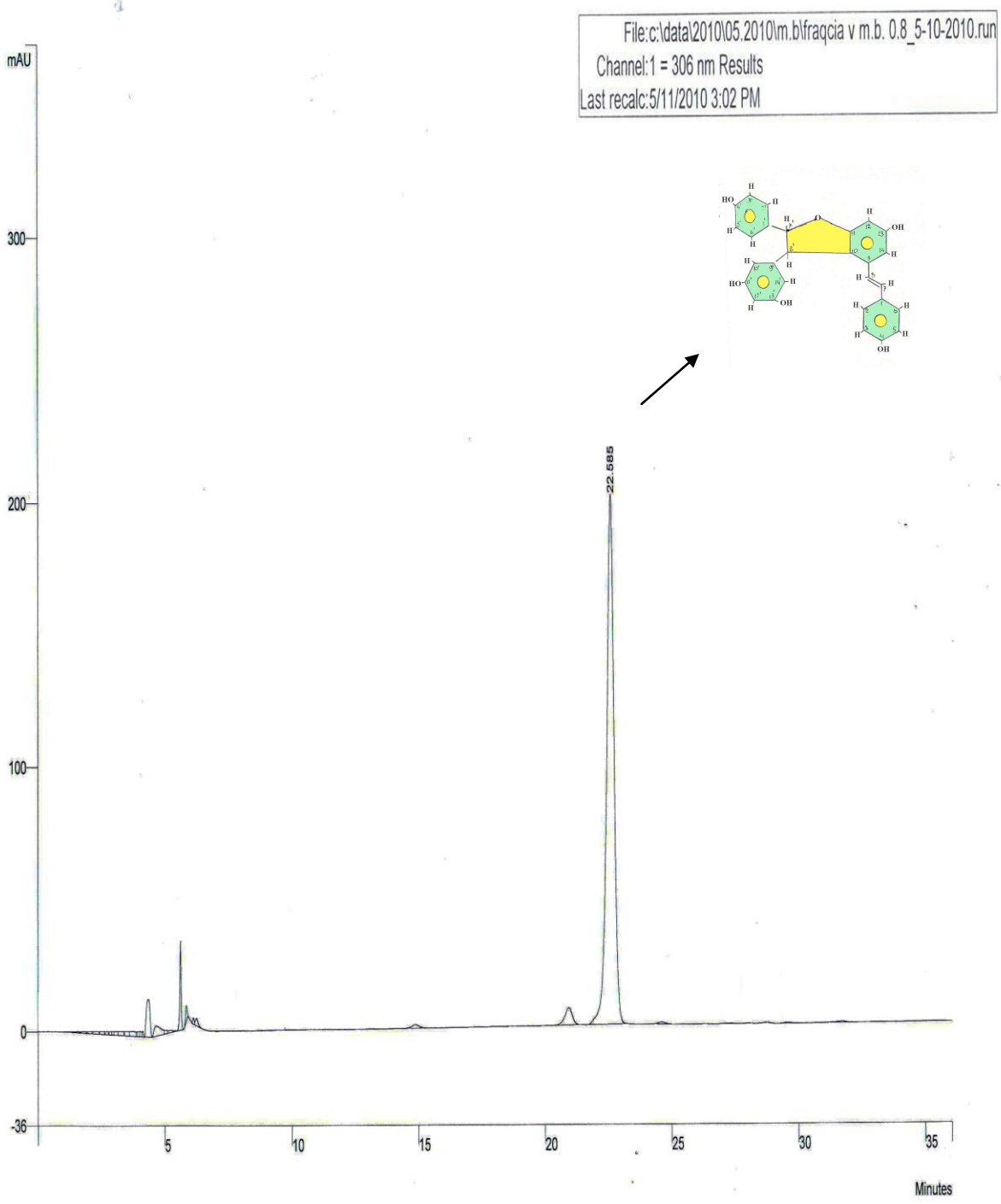
wiTelyurZniani vazis jiSebis yurZnis kanis saZiebeli naerTis da individualuri ε ε-viniferinis qromatografiuli da speqtraluri maCveneblebi

vazis jiSi	Rf		laqis feri		λmax,nm	
	saZiebeli	ε-viniferinis	saZiebeli	ε-viniferinis	saZiebeli	ε-viniferinis
1.saferavi	0,67	0,67	moyviTalo-yavisferi	moyviTalo-yavisferi	300_307	300_310
2.ocxanuri safere	0,67	0,67	" -- -- "	" -- -- "	300-305	" -- -- "
3.kaberne	0,67	0,67	" -- -- "	" -- -- "	300_306	" -- -- "
4.saferavi budeSurisebri	0,66	0,67	" -- -- "	" -- -- "	300_307	" -- -- "
5.ojaleSi	0,67	0,67	" -- -- "	" -- -- "	300_308	" -- -- "
6.aladasturi	0,67	0,67	" -- -- "	" -- -- "	300_307	" -- -- "
7.Cxaveri	0,67	0,67	" -- -- "	" -- -- "	300_306	" -- -- "
8.aleqsandrouli	0,66	0,67	" -- -- "	" -- -- "	300_308	" -- -- "
9.mujureTuli	0,67	0,67	" -- -- "	" -- -- "	300_305	" -- -- "
10.asureTuli Savi	0,67	0,67	" -- -- "	" -- -- "	300-306	" -- -- "

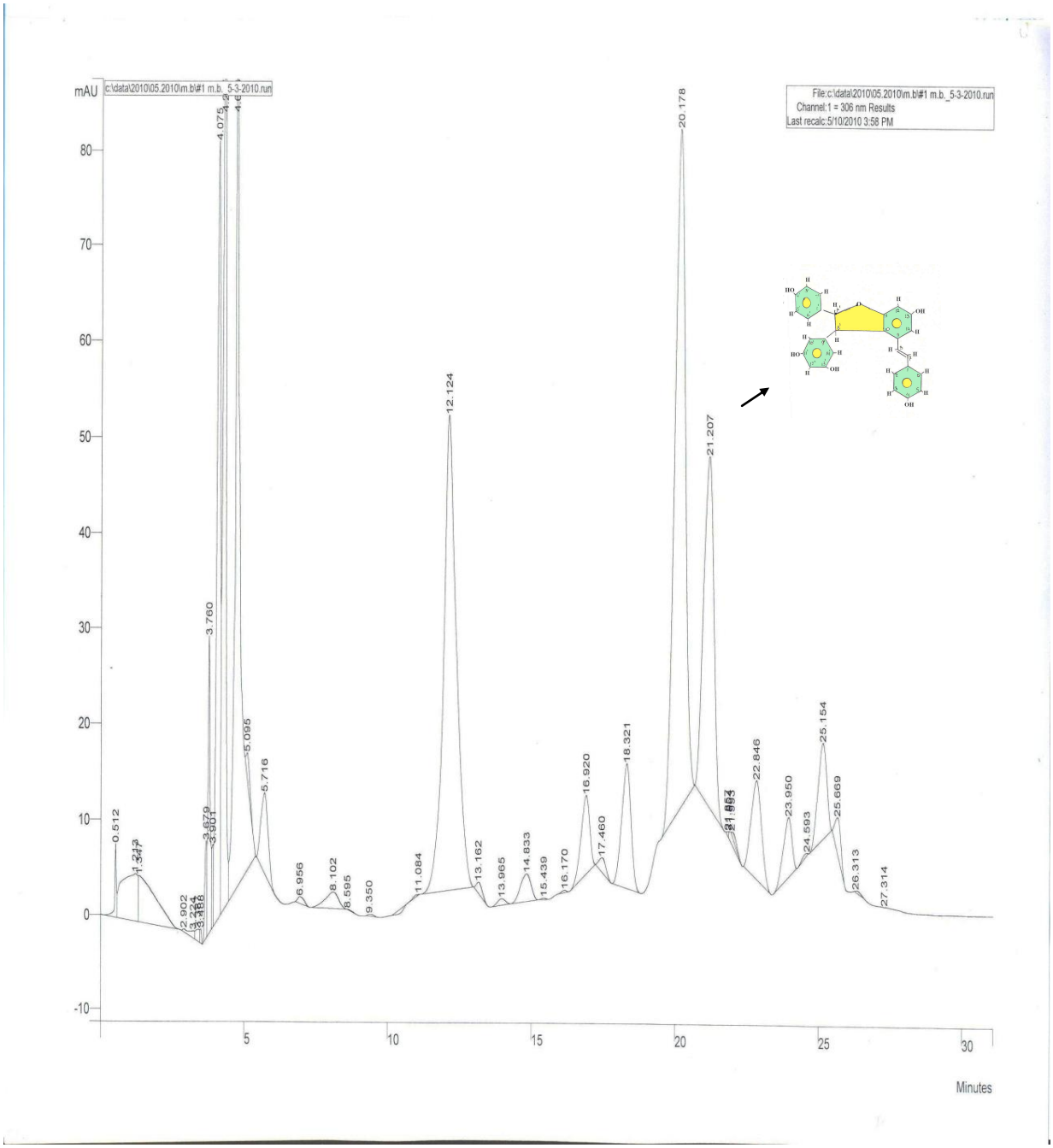
2.3. ε-viniferinis da trans-rezveratrolis raodenobrivi gansazRvra vazis wiTelyurZnian jiSebSi

yurZnis kanebidan momzadebuli sakvlevi stilbenSemcveli jamuri preparatebi gamoviyeneT siTxuri qromatografiisTvis da raodenobrivad ganvsazRvreT **ε** ε-viniferini da trans-rezveratroli. aqve unda aRiniSnos, rom trans-rezveratrolis Semcveloba winagamokvlevebiT (beJuaSvili, koxtaSvili, 1999-2002) dadgenilia saferavis, kaberne-sovinionis, ocxanuri saferes da Tavkveris yurZnis kanSi. winamdebare naSromiT **pirvelad** warmodgenilia trans-rezveratrolis Semcveloba ojaleSis, aladasturis, Cxaveris, aleqsandroulis, mujureTulis, asureTuli Savis jiSebis yurZnis kanebSi. rac Seexeba **ε** ε**-viniferins,** igi siaxlea TiToeuli saeqsperimento obieqtisTvis.

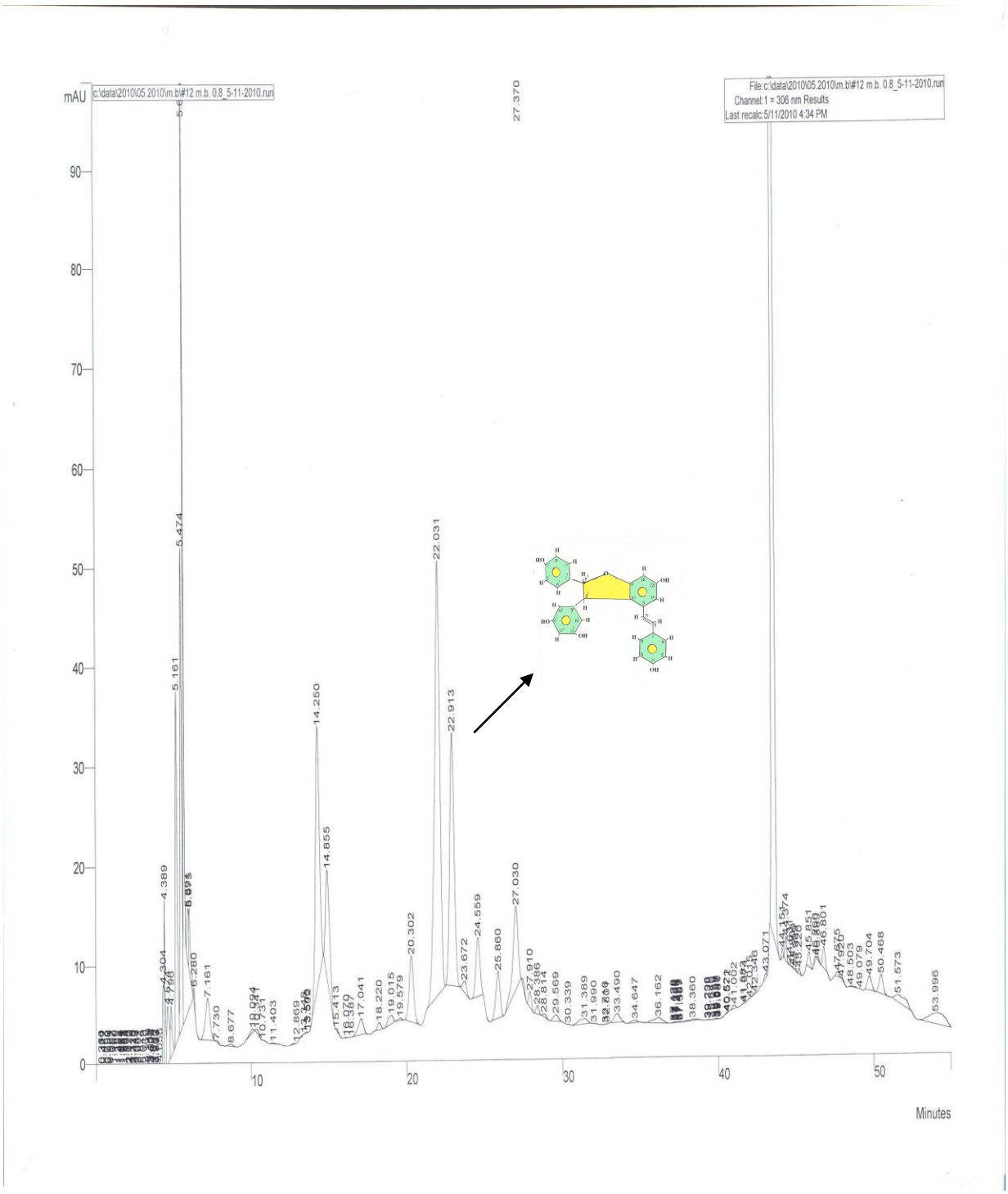
qromatografiuli Sedegebi warmodgenilia sur.2.3.1-10, xolo raodenobrivi Semcveloba cxr. 2.3.1-2



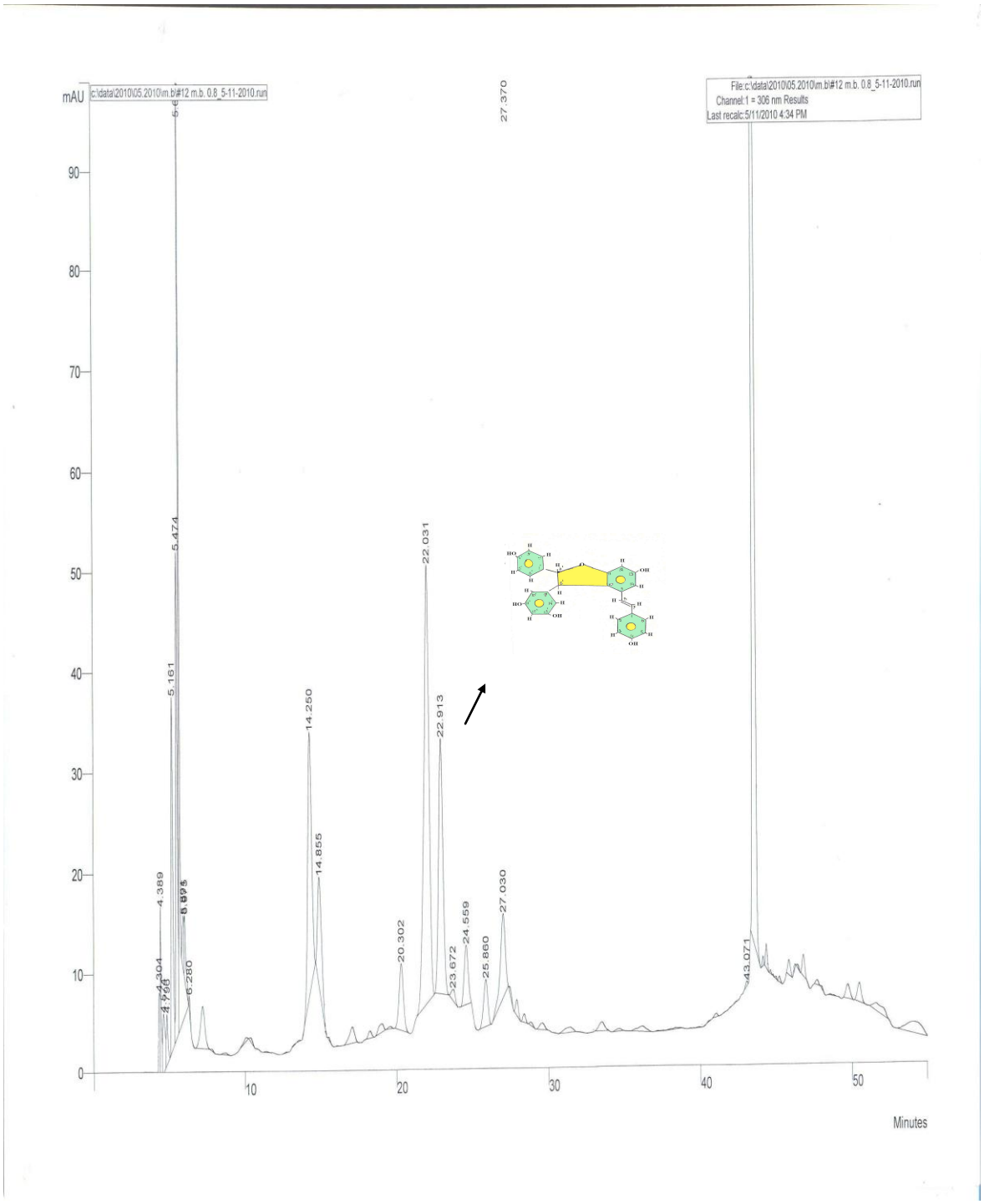
2.3.1. ε-viniferinis individualuri siTxuri qromatograma



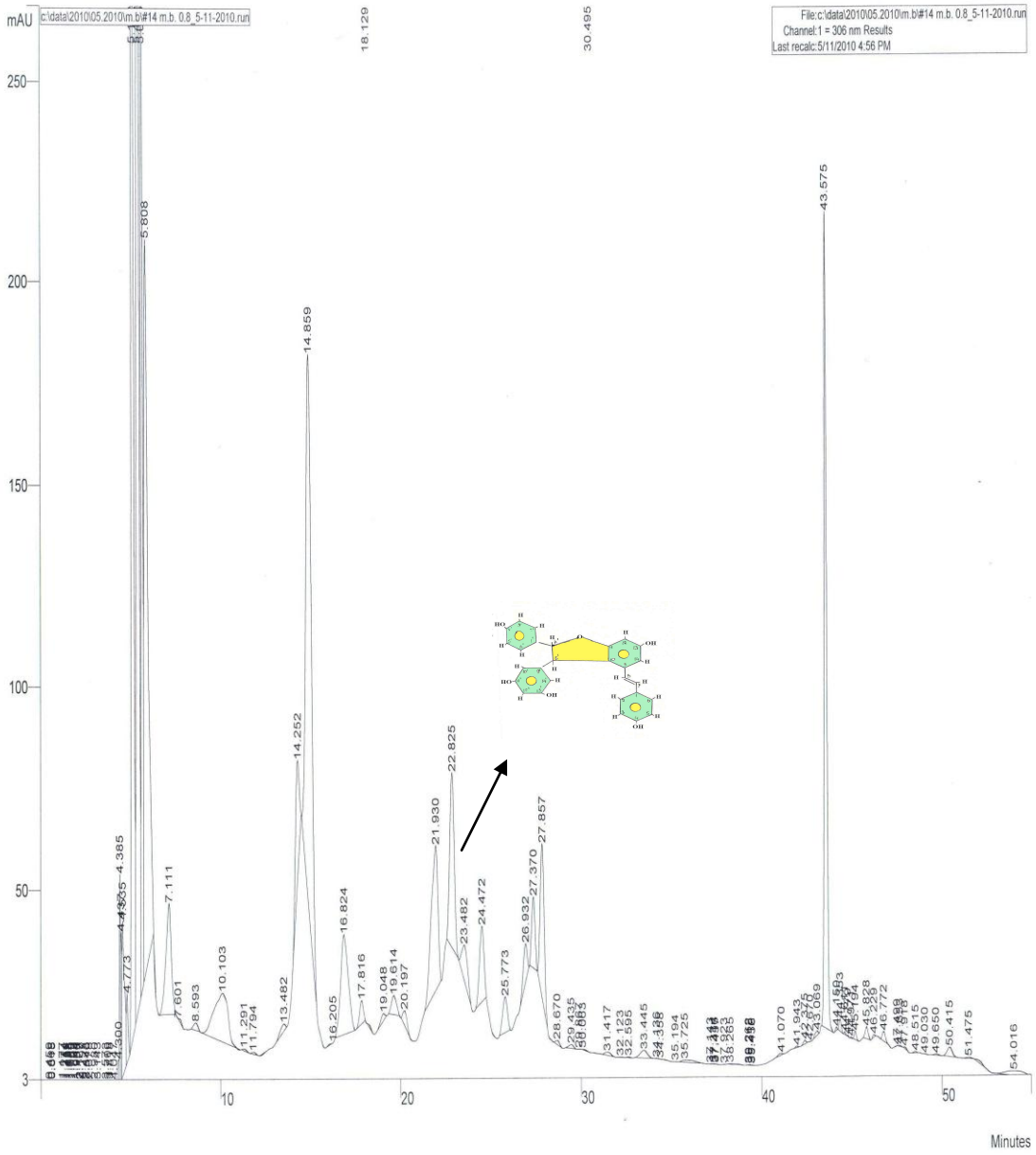
sur. 2.3.1.a° saferavis (axaSeni) yurZnis kanis stilbenSemcveli fraqciis siTxuri qromatograma



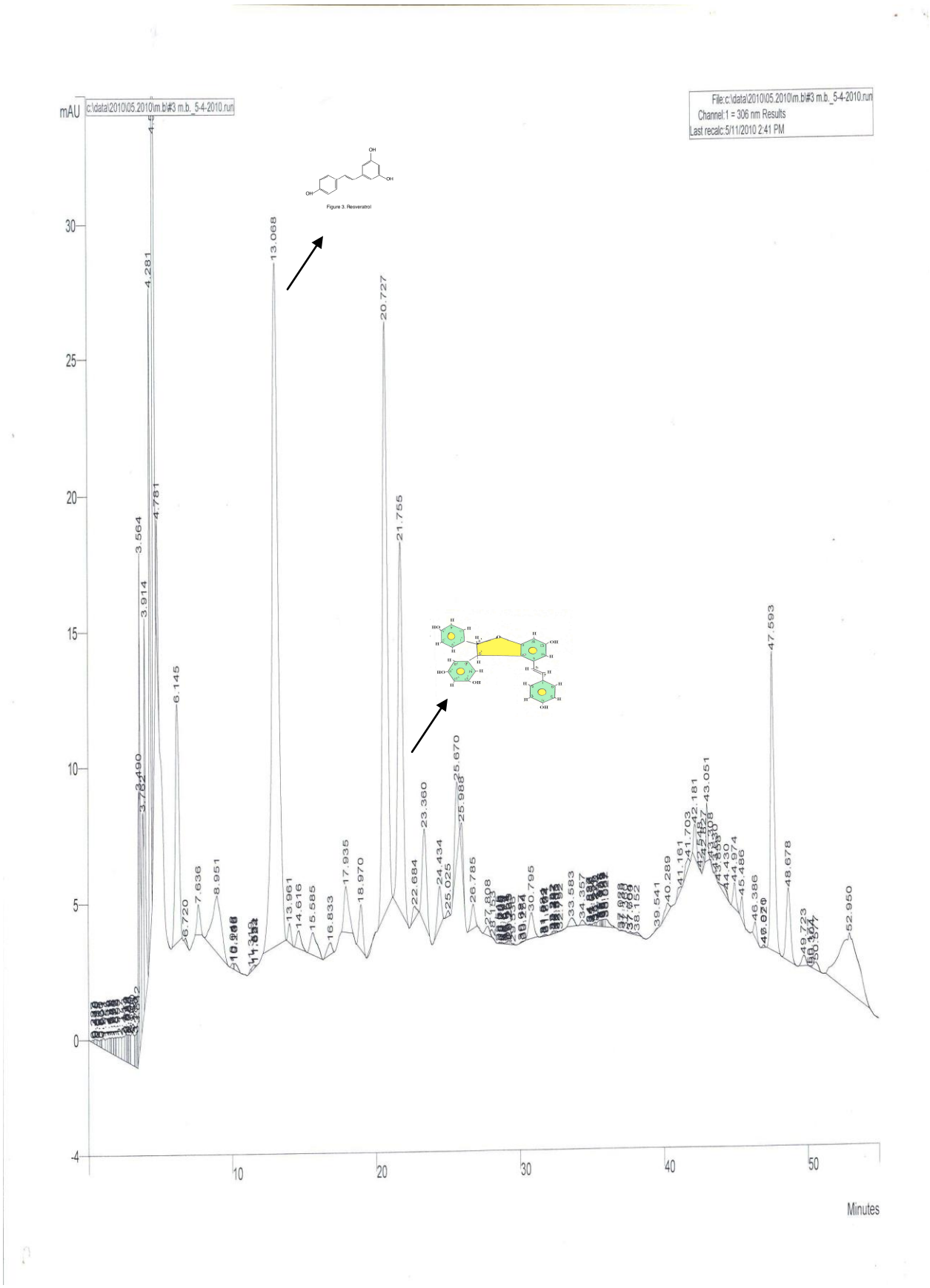
sur. 2.3.1.b saferavis (kardenaxi) yurZnis kanis stilbenSemcveli fraqciis siTxuri qromatograma



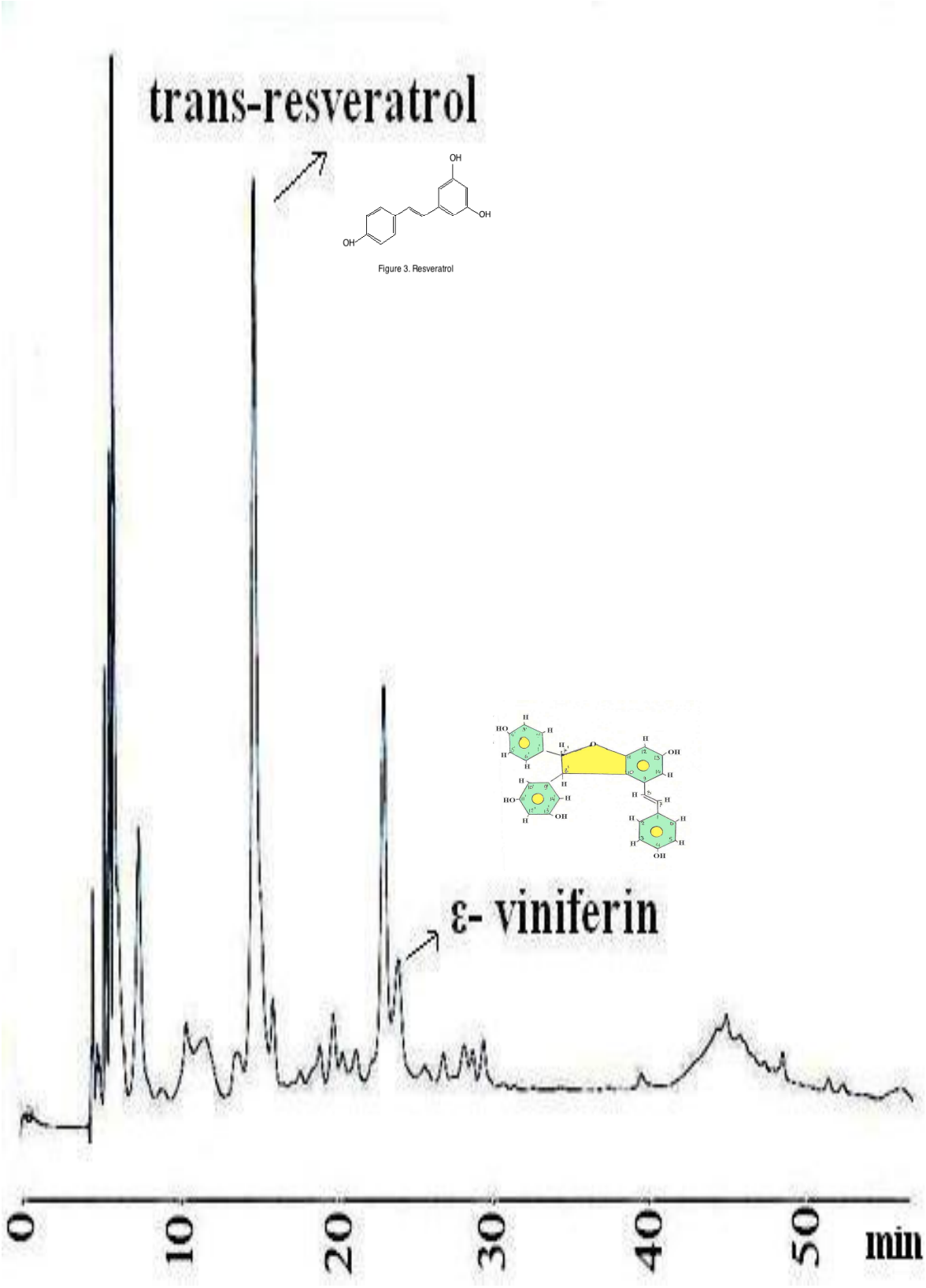
sur.2.3.1.g saferavis (qinZmarauli) yurZnis kanis stilbenSemcveli fraqciis siTxuri qromatograma



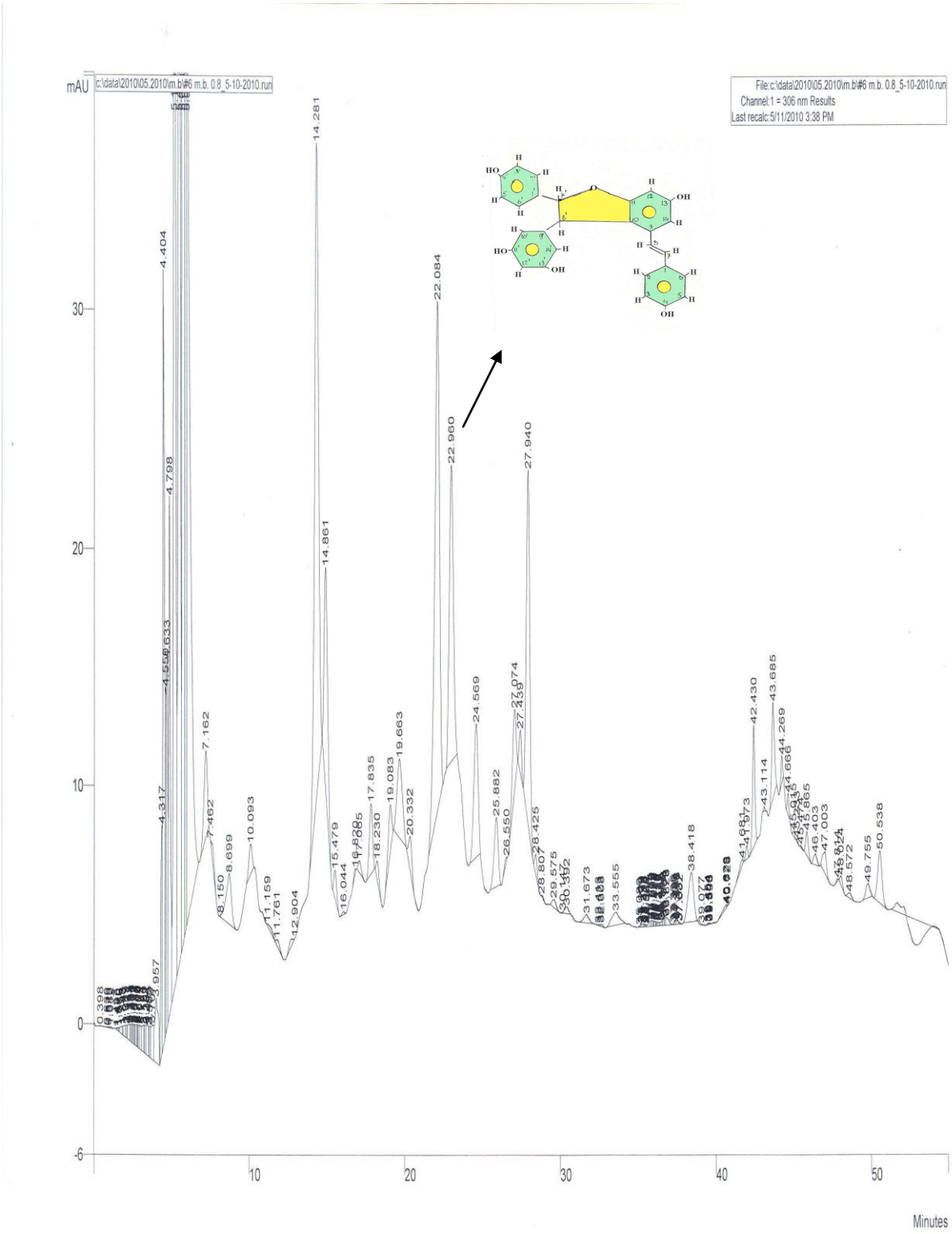
sur. 2.3.1.d saferavis (winandali) yurZnis kanis stilbenSemcveli fraqciis siTxuri qromatograma



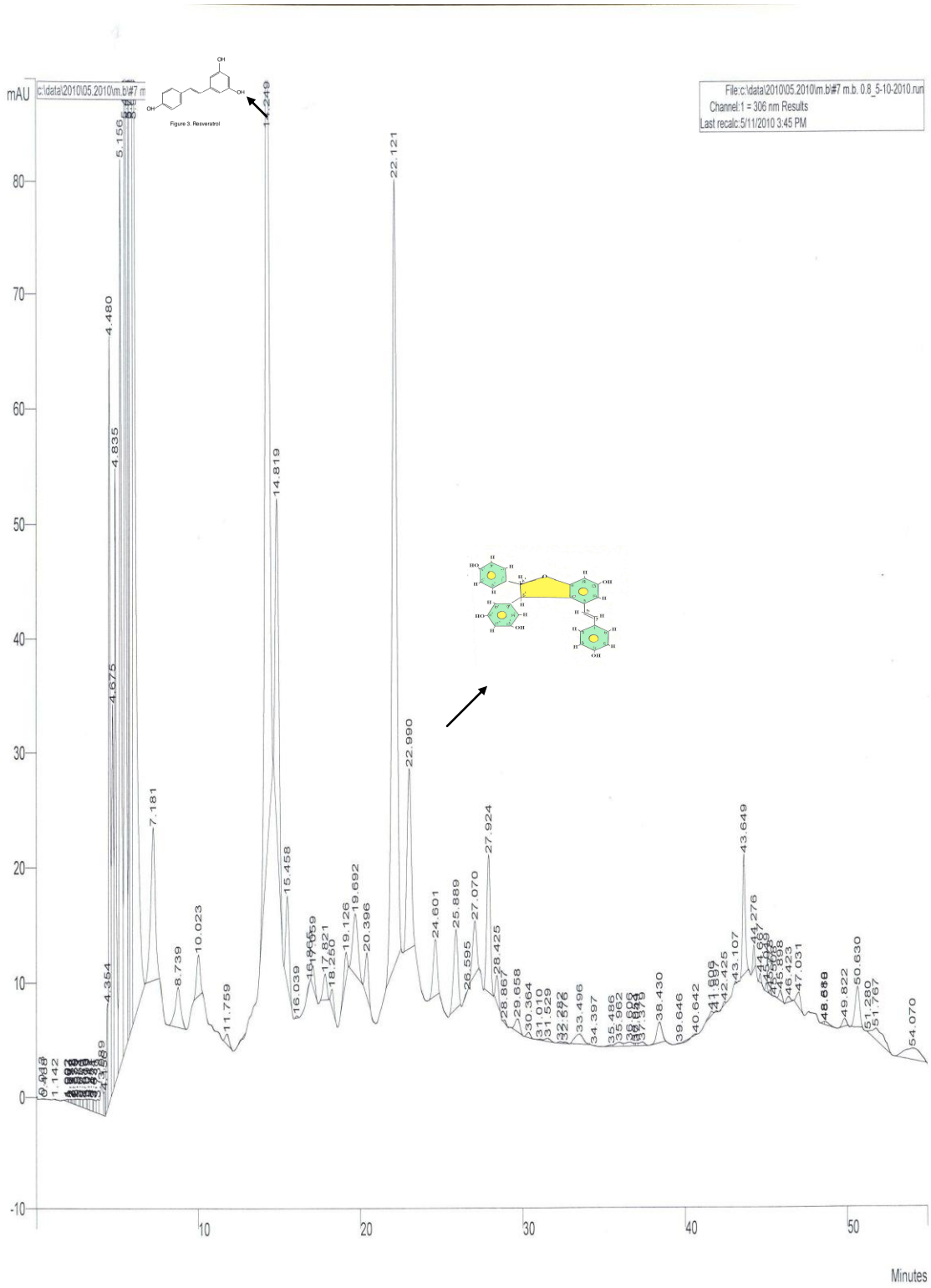
sur. 2.3.2 kaberne-sovinionis yurZnis kanis stilbenSemcveli fraqciis siTxuri qromatograma



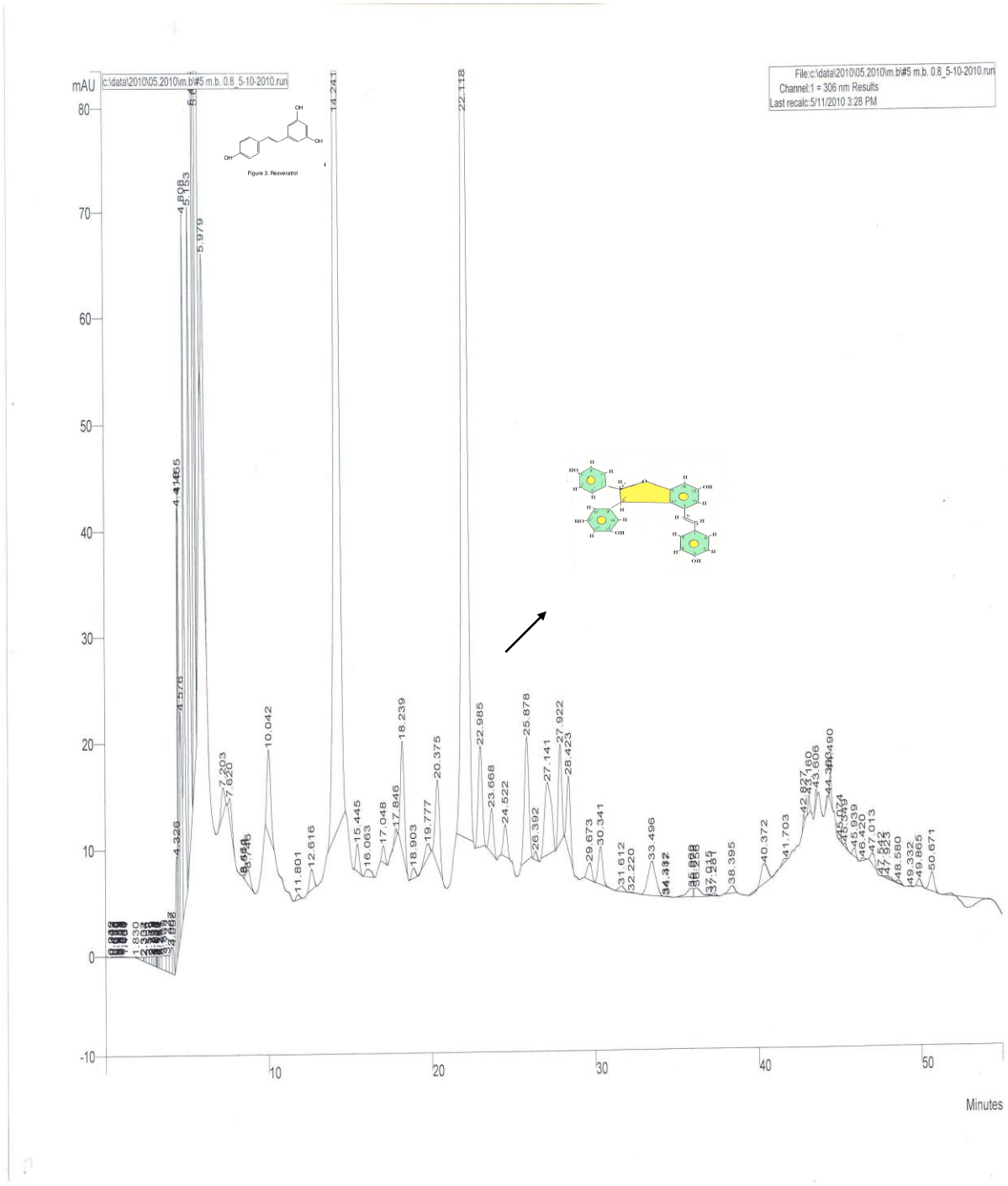
sur.2.3.3. ocxanuri saferes yurZnis kanis stilbenSemcveli fraqciis siTxuri qromatograma



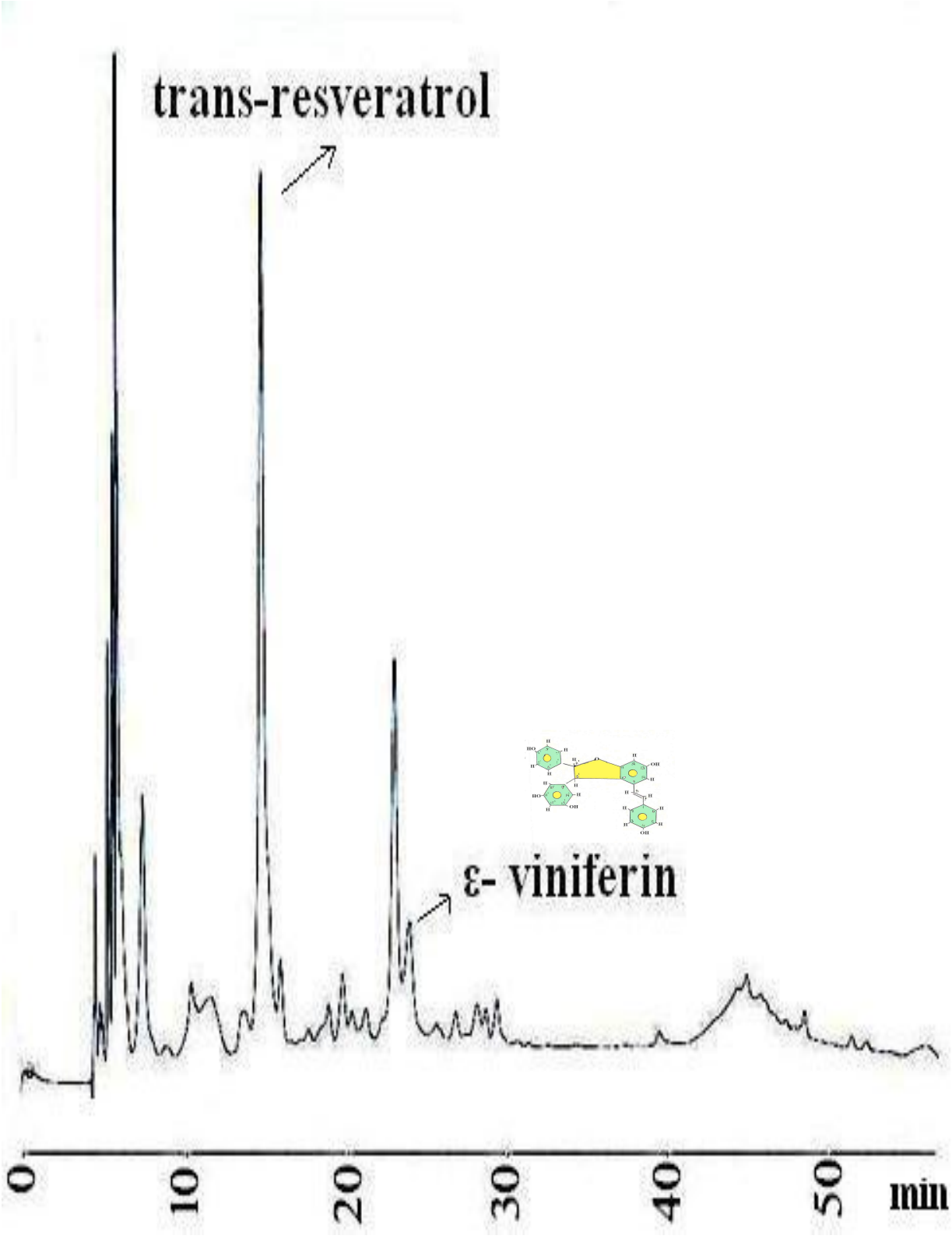
sur.2.3.4 ojaleSis yurZnis kanis stilbenSemcveli fraqciis siTxuri qromatograma.



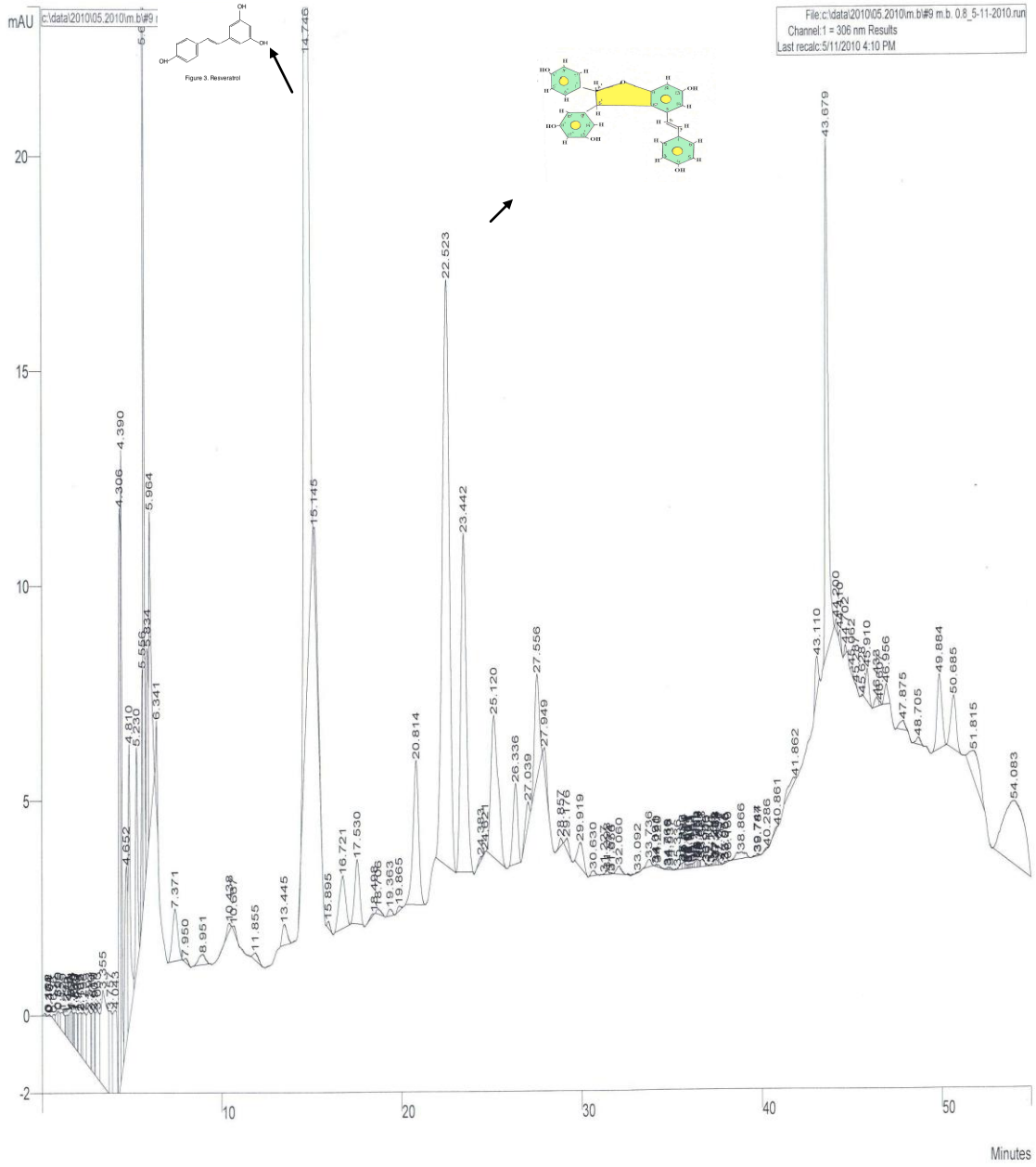
sur. 2.3.5. aladasturis yurZnis kanis stilbenSemcveli fraqciis siTxuri qromatograma



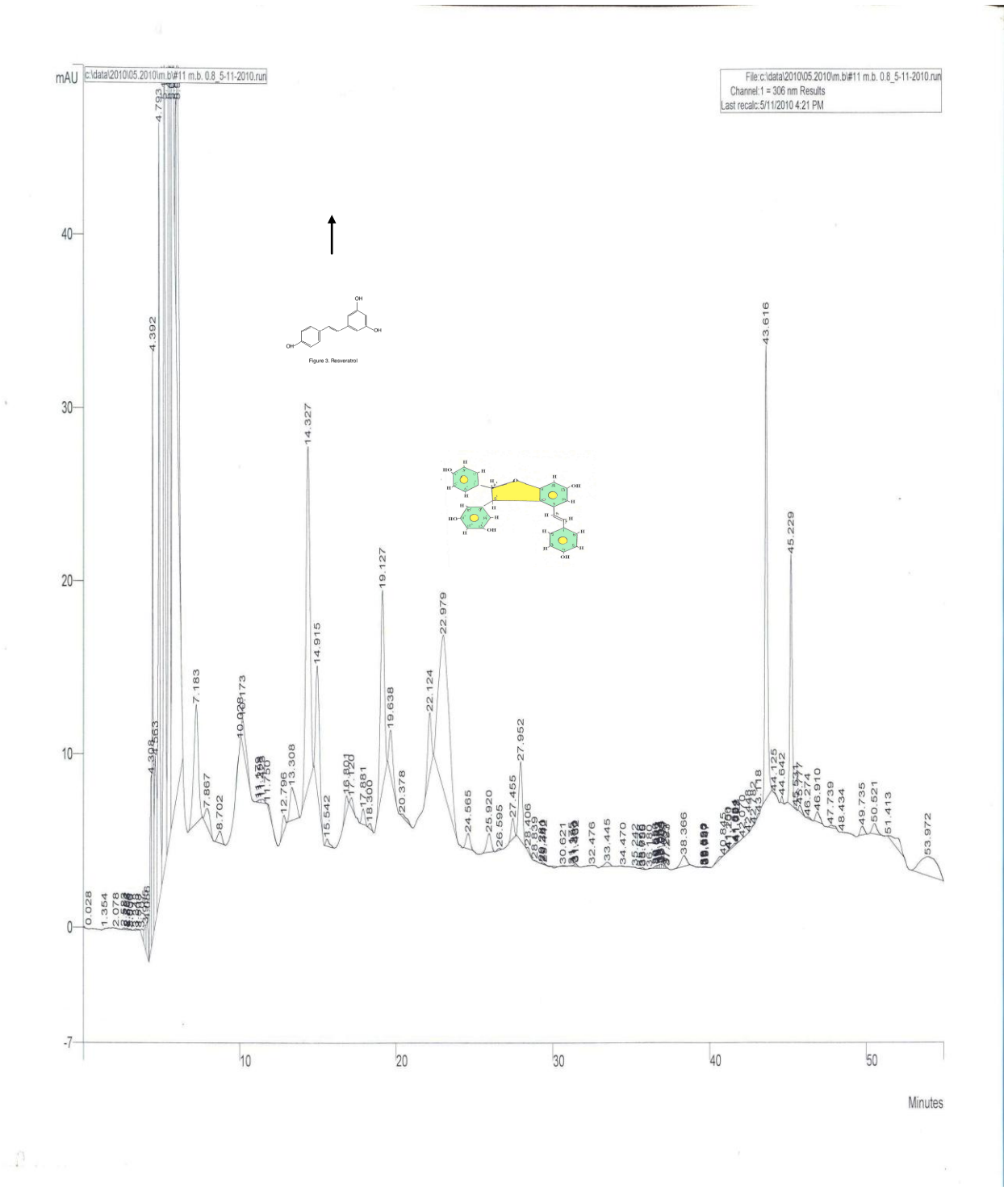
sur. 2.3.6. Cxaveris yurZnis kanis stilbenSemcveli fraqciis siTxuri qromatograma



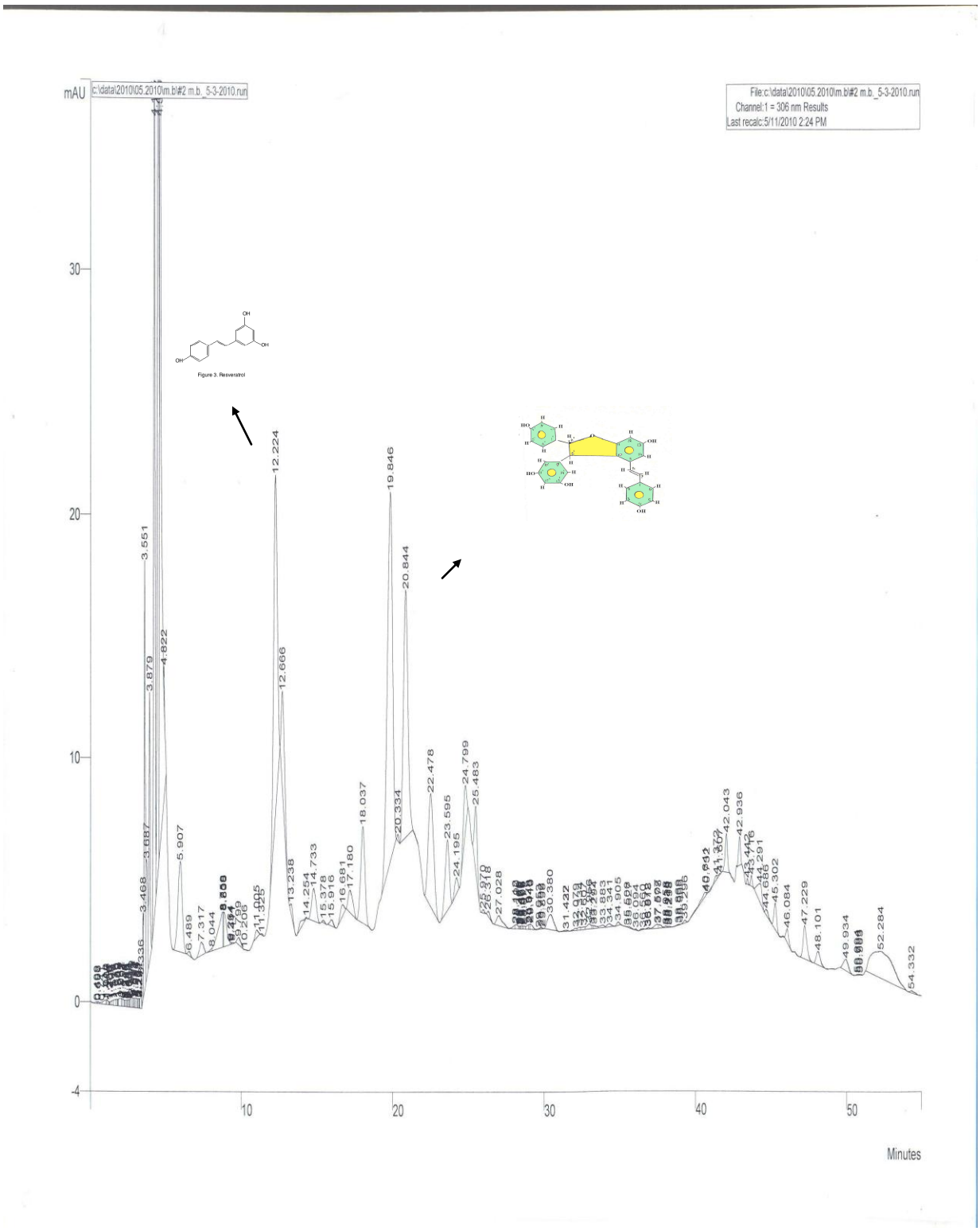
sur. 2.3.7 aleqsandroulis yurZnis kanis stilbenSemcveli fraqciis siTxuri qromatograma



sur.2.3.8 mujureTulis yurZnis kanis stilbenSemcveli fraqciis siTxuri qromatograma.



sur. 2.3.9 asureTuli Savis yurZnis kanis stilbenSemcveli fraqciis siTxuri qromatograma.



sur. 2.3.10. saferavi budeSurisebris yurZnis kanis stilbenSemcveli fraqciis siTxuri qromatograma.

cxrili 2.3.1.

ε_viniferinis qromatografiuli maxasiaTeblebi da

Kkoncentracia (mg/100g) yurZnis kanebSi

jiSis dasaxeleba	RRT	S_pikis farTobi	C_mg/100mg
1.saferavi (axaSeni)	1,64	9272097	0,67
2.saferavi (kardenaxi)	1,61	5041769	0,69
3.saferavi (qinZmarauli)	1,56	5301206	0,48
4.saferavi (winandali)	1,56	7367184	0,98
5.saferavi budeSurisebri	1,63	2076984	0,38
6.kaberne-sovinioni	1,65	3096811	0,40
7.ocxanuri safere	1,61	2045396	0,34
8.ojaleSi	1,61	2303514	0,43
9.aladasturi	1,61	2850013	0,30
10.aleqsandrouli	1,61	3659745	0,57
11.mujureTuli	1,59	1685422	0,26
12.Cxaveri	1,61	1581170	0,26
13.asureTuli Savi	1,60	4053844	0,45

stilbenSemcveli jamuri preparatebis siTxuri qromatogramebi saeqsperimento vazis jiSebSi stilbenuri speqtris mravalferovnebaze miuTiTebs. maT Soris fiqsirdeba stilbenebis monomeruli warmomadgeneli trans-rezveratroli da saZiebeli ε-viniferini. cxrili 2.3.2.

cxrili 2.3.2

trans-rezveratrolis da ε–viniferinis

Semcveloba yurZnis kanSi, mg/100g

jiSebi	trans-rezveratroli	□ □ε - viniferini
saferavi	6.67	0.67
saferavi budeSurisebri	1.86	0.38
kaberne-sovinioni	2.96	0.4
ocxanuri safere	6.07	0.34
Cxaveri	1.73	0.26
ojaleSi	2.92	0.43
aladasturi	3.96	0.3
aleqsandrouli	3.21	0.57
mujureTuli	2.26	0.26
asureTuli Savi	2.06	0.45
saferavis gavrcelebis adgili		
axaSeni	6.67	0.67
kardenaxi	4.46	0.69
qinZmarauli	3.52	0.48
winandali	4.63	0.98

sakvlev obieqtebs Soris ε-viniferinis SedarebiT maRali SemcvelobiT gamoirCeva saferavis da aleqsandr�ulis yurZnis kani - 0,67 mg/100g da 0,57 mg/100g. TiToeuli sakvlevi jiSis yurZnis kanSi monomeruli trans-rezveratroli da misi dimeri ε-viniferini lokalizoϖebulia erTnairi kanonzomierebiT: trans-rezveratrolis koncentracia mniSvnelovnad aRemateba ε-viniferinis koncentracias.

trans-rezveratrolis SedarebiT maRali SemcvelobiT xasiaTdeba saferavi, ocxanuri safere da aladasturi (cxr. 2.3.2.). gasaTvaliswinebelia is faqti, rom sacdeli jiSebi gavrcelebulia aRmosavleT da dasavleT saqarTvelos sxvadasxva, erTmaneTisgan agro-klimaturi pirobebiT gansxvavebul mevenaxeobis raionebSi. am faqtoris gavleniT, cnobilia, rom stilbenebis dagroveba Taviseburi biosinTezis safuZvelze mimdinareobs da Sedegic gamoixateba maTi

koncentraciis sxvaobiT.. literaturuli monacemebiT, stilbenebis dagrovebaze gavlenas axdens ramdenime faqtori, romlebic SeiZleba daiyos 2 jgufad: I – mosavlis aRebamde da II – mosavlis aRebis Semdgomi. I jgufSi gaerTianebulia: vazis jiSuri genetika, vazis damuSavebis meTodebi, amindi – klimaturi pirobebi, sinaTlis moqmedeba, vazis mavneblebi da maTTan brZola, niadagi, mosavlis aRebis dro. II - jgufidan ZiriTadia yurZnis Senaxvis da gadamuSavebis teqnologiuri xerxebi. ε-viniferinis Semcvelobis mixedviT, dasavleT saqarTveloSi gavrcelebuli jiSebi ganlagda Semdegi TanmimdevrobiT: aleqsandrɷuli > ojaleSi > ocxanuri safere > aladasturi > Cxaveri > mujureTuli. trans-rezveratrolis Semcvelobis mixedviT, igive jiSebSi gamoikveTa Semdegi Tanmimdevroba: ocxanuri safere > aladasturi > aleqsandrɷuli > ojaleSi > mujureTuli. rac Seexeba saferavis yurZnis kanSi ε-viniferinis koncentracias, jiSis gavrcelebis adgilis mixedviT, ganlagda Semdegi TanmimdevrobiT: winandali > kardenaxi > axaSeni > qinZmarauli. trans-rezveratrolis mixedviT ki Tanmimdevroba Semdegia: axaSeni > winandali > kardenaxi > qinZmarauli.

amgvarad, Catarebuli eqsperimentis Sedegɔd gamovlinda saqarTveloSi gavrcelebuli vazis sawarmoo feradyurZniani jiSebis yurZnis kanis mravalferovani stilbenuri speqtri. dadginda, rom yurZnis kanSi biologiurad aqtiuri monomeruli stilbenis trans-rezveratrolis da misi dimeris ε-viniferinis raodenobrivi Semcveloba cvalebadia vazis jiSis da misi gavrcelebis adgilze damokidebulebiT. amasTan, TiToeul maTganSi SeiniSneba erTi kanonzomiereba - rezveratrolis koncentracia mniSvnelovnad aRemateba ε-viniferinis koncentracias.

2.4. ε-viniferinis koncentraciis damokidebuleba Rvinis tipze

sxvadasxva tipis RvinoebSi ε-viniferinis raodenobrivi Semcvelobis da misi cvalebadobis Sesaswavlad mizanSewonilad miviCnieT eqsperimentis Catareba sufris mSral da bunebrivad naxevradtkbil wiTel Rvinomasalebze. aRniSnuli kvlevis obieqtebi davamzadeT Rvinis kompania “SumSi” da gamovikvlieT bunebrivad dawmendili saxiT erTwliani formirebis periodSi. ε-viniferinis koncentraciis cvalebadobas vadgendiT pirveli, meore gadaRebebis Semdeg da erTwliani formirebis RvinomasalebSi. meore gadaRebis Semdeg bunebrivad dawmendili Rvino-masalebis qimiuri maCveneblebi warmodgenilia cxrilSi 2.4.1.

cxrili 2.4.1

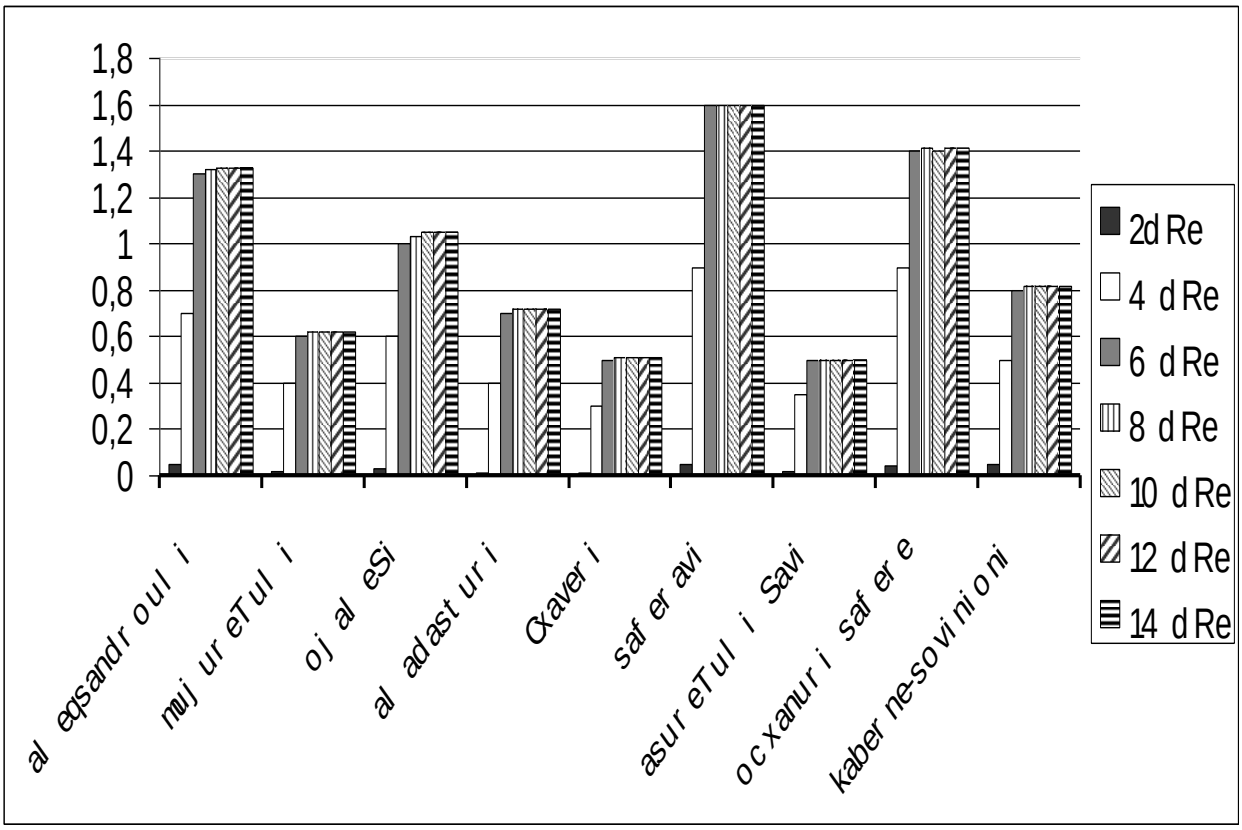
bunebrivad dawmendili sacdeli Rvinomasalebis qimiuri maCveneblebi

dasaxeleba	alkoholi moc.%	titruli mJ. g/l	mqrolavi mJ. g/l	Saqari g/100ml	eqstraqti g/l

saferavi_mSrali (kardenaxi)	**12,7**	**6,5**	**0,54**	**0,15**	**28,9**
saferavi_mSrali (winandali)	**12,39**	**7,0**	**0,2**	**0,3**	**29,3**
saferavi_mSrali (nafareuli)	**12,91**	**6,4**	**0,49**	**0,1**	**27,8**
ocxanuri safere_mSrali (zesatfoni)	**11,84**	**7,0**	**0,62**	**0,22**	**29,2**
kaberne_mSrali (winandali)	**11,72**	**6,6**	**0,59**	**0,2**	**25,1**
aladasturi_ mSrali (ozurgeTi)	**11,84**	**6,8**	**0,39**	**0,07**	**24,8**
Cxaveri_mSrali vardisferi (ozurgeTi)	**10,69**	**5,6**	**0,49**	**0,05**	**23,2**
saferavi_ bunebrivad n/tkb. (qinZmarauli)	**12,7**	**6,7**	**0,46**	**4,3**	**30,4**
saferavi_ bunebrivad n/tkb. (axaSeni)	**13,12**	**6,4**	**0,6**	**4,7**	**33,1**
ojaleSi_ bunebrivad n/tkb. (martvili)	**13,2**	**6,2**	**0,46**	**4,1**	**32,5**
mujureTuli_ bunebrivad n/tkb. (ambrolauri)	**12,07**	**6,7**	**0,5**	**4,6**	**26,1**
aleqsandrouli_ bunebrivad n/tkb. (ambrolauri)	**10,79**	**6,6**	**0,46**	**4,8**	**23,6**
asureTuli Savi – mSrali (asureTi)	**11,3**	**5,5**	**0,52**	**0,2**	**25,2**

2.4.1 ε-viniferinis cvalebadoba sufris mSral wiTel RvinomasalebSi

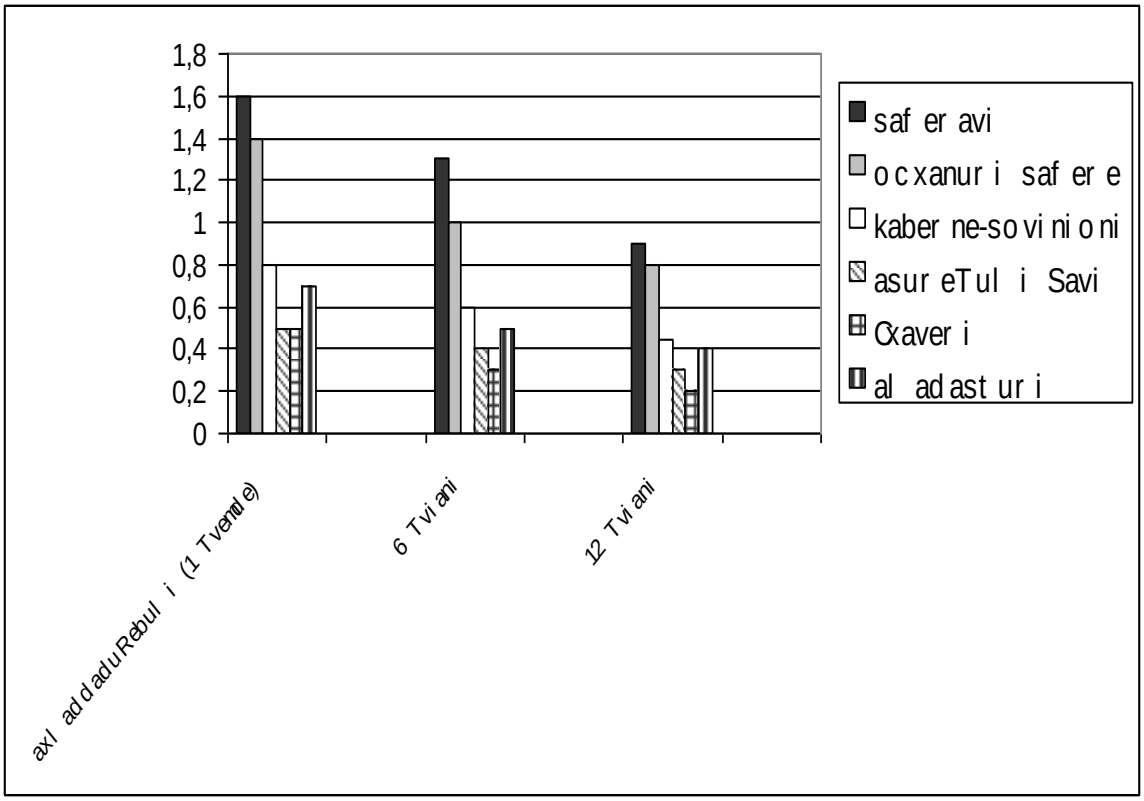
ε-viniferini aris yurZnis kanSi lokalizirebuli nivTiereba da misi gadasvla moduRari durdodan RvinomasalaSi xdeba eqstraqciis gziT. ε-viniferini, trans-rezveratrolTan SedarebiT, wyalSi kargad xsnadia da, aqedan gamomdinare, mosalodnelia misi swrafi dagrovebis dinamika. amis dasadastureblad davakvirdiT saferavis, ocxanuri saferes, kaberne-sovinionis, aladasturisa da asureTuli Savis uklerto durdos alkoholur duRils mSrali Rvinomasalis misaRebad. duRili CavatareT 28_30^{0}C temperaturaze da ε-viniferins raodenobrivad vsazRvravdiT 2_14 dRian intervalSi 2 dRiani SualediT.



nax. 2.4.1.1. ε-viniferinis dagrovebis dinamika durdos alkoholur duRilSi

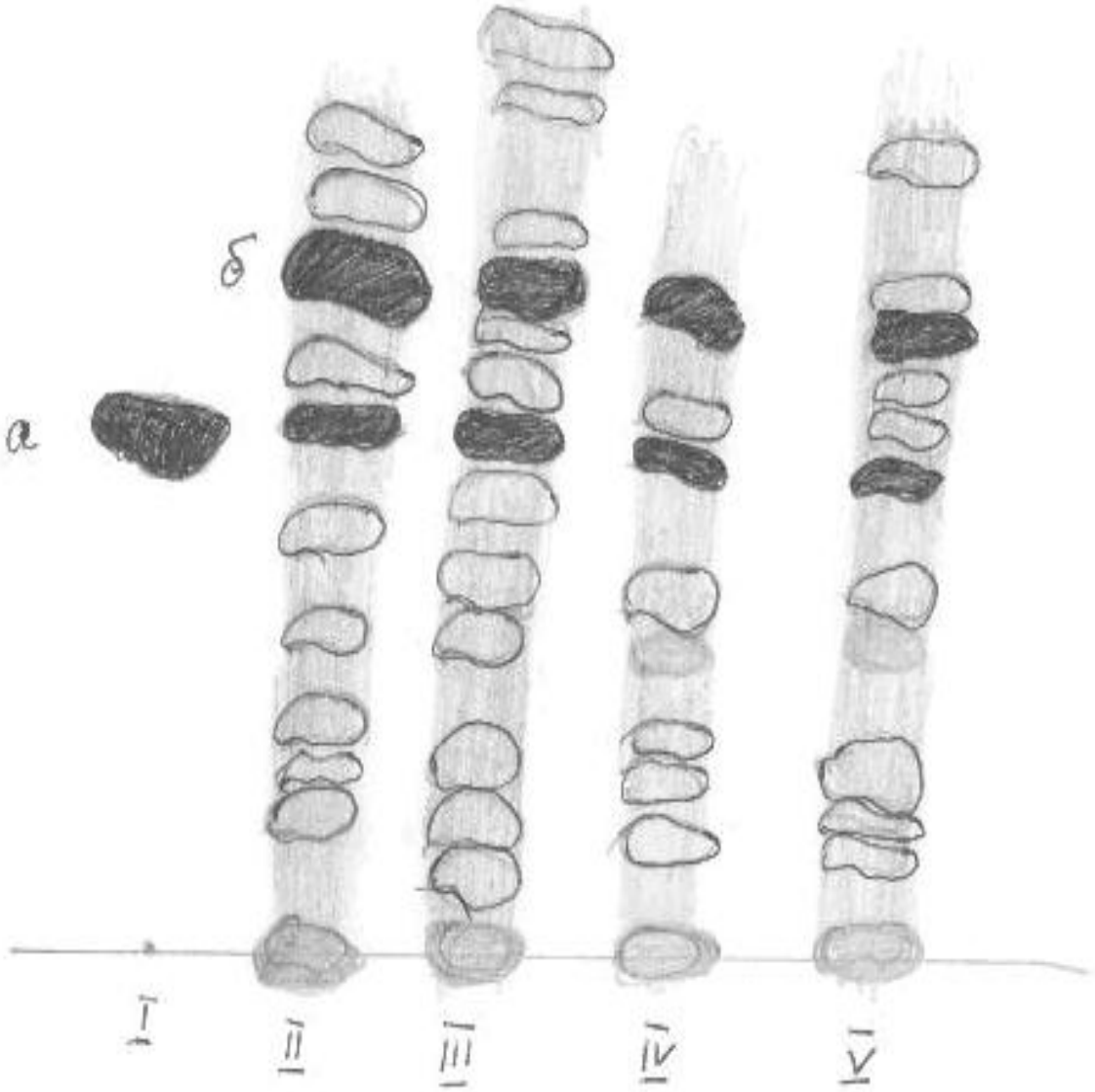
aRmoCnda, rom ε-viniferinis intensiuri dagroveba xdeba duRilis 2_5 dRian intervalSi da Semdgom periodSi misi koncentracia umniSvnelod izrdeba. saferavis axladdaduRebul mSral RvinomasalaSi ε-viniferinis koncentracia Seadgens 1,6 mg/l, ocxanur safereSi _ 1,4 mg/l, kaberne-sovinionSi _ 0,8 mg/l, aladasturSi _ 0,7 mg/l, asureTul SavSi _ 0,5 mg/l, aleqsandroulSi – 1,33 mg/l, mujureTulSi - 0,62 mg/l, ojaleSSi – 1,05 mg/l, CxaverSi – 0,51 mg/l

ε-viniferinis koncentraciis cvalebadobis dasadgenad sufris mSrali Rvinomasalebis erTwliani formirebis periodSi, sacdeli Rvinomasalebi movaTavseT saRvine minis WurWlebSi, SevavseT bolomde, davxureT da movaTavseT 12_14^{0}C temperaturaze. saZiebeli nivTiereba ganvsazRvreT axladdaduRebul RvinomasalebSi, me-2 gadaRebis Semdeg (eqvsTviani) da erTwliani formirebis Semdeg, Sedegebi warmodgenilia nax. 2.4.1.2.



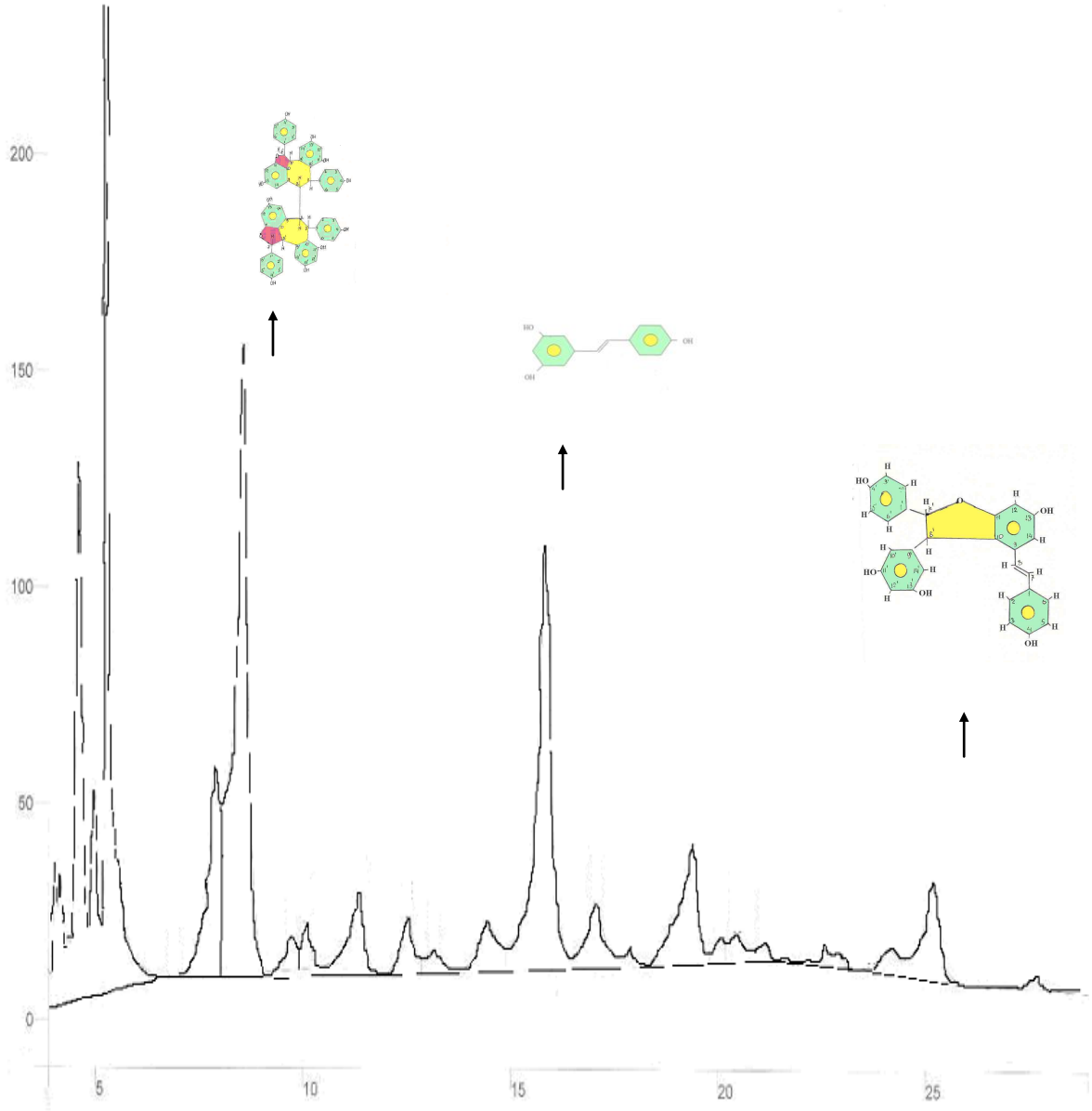
nax. 2.4.1.2. ε-viniferinis koncentraciis cvalebadoba sufris mSrali wiTeli Rvinomasalebis erTwliani formirebis periodSi

ε-viniferinis cvalebadobis dasadgenad gamoviyeneT Txelfenovani, preparatuli da siTxuri qromatografiis meTodi.

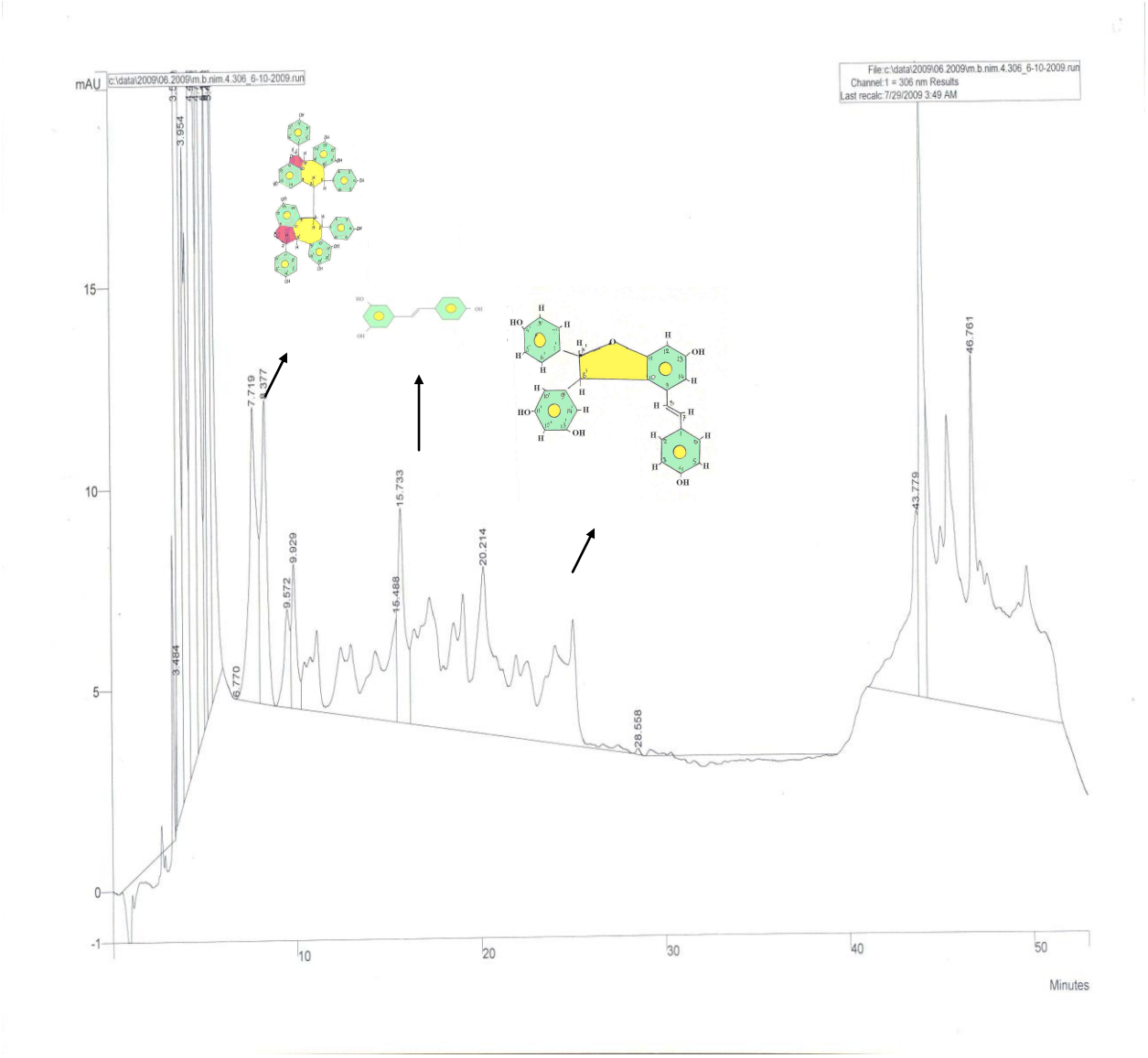


nax. 2.4.1.3 saferavis da kaberne sovinionis yurZnis kanis da Rvinoebis stilbenSemcveli fraqciebis Txelfenovani qromatograma. sistema qloroformi:meTanoli (80:20) I-a- ε viniferini,

II-b – trans rezveratroli; II saferavis kani; III – saferavis Rvino; IV – kabernes kani; V – kabernes Rvino.



nax. 2.4.1.4. saferavis sufris mSrali Rvinis stilbenSemcveli fraqciis siTxuri qromatograma.



nax. 2.4.1.5. kaberne-sovinionis sufris mSrali Rvinis stilbenSemcveli fraqciis siTxuri qromatograma.

eqsperimentiT dafiqsirda ε-viniferinis raodenobrivi Semcireba sufris mSral wiTel RvinomasalebSi maTi erTwliani formirebis periodSi. es cvlileba raodenobrivad Semdegia: saferavisTvis 1,6_0,9mg/l; ocxanuri saferesTvis 1,4_0.8mg/l; kaberne sovinionisTis 0.8_0.45mg/l; asureTuli SavisTvis 0.5_0.3mg/l; aladasturisTvis 0.7_0.35mg/l; CxaverisTvis 0.5_0.2mg/l. sacdeli Rvinomasalebis formirebis 1_12 Tviani periodi xasiaTdeba araerTgvarovani etapobrivi cvlilebiT.

2.4.2. ε-viniferinis cvalebadoba bunebrivad naxevradtkbil wiTel RvinomasalebSi

eqsperimentSi gamoviyeneT Semdegi bunebrivad naxevradtkbili wiTeli Rvinomasalebi: saferavisgan damzadebuli _ axaSeni, qinZmarauli; ojaleSisagan, aleqsandroulisa da

mujureTulisgan damzadebuli bunebrivad naxevradtkbili wiTeli Rvinomasalebi. TiToeul maTganSi **ε-viniferinis** cvalebadobis dasadgenad maTi erTwliani formirebis periodSi, boTlebSi Camosxmuli Rvinomasalebi movaTavseT 8_10^{0}C temperaturaze 2 variantis mixedviT; I varianti _ sakontrolo, pasterizaciis gareSe _ da II varianti _ cxlad Camosxmuli (65^{0}C, 2_3wT). ε -viniferinis gansazRvras vaxdendiT axladdaduRebul, me_2 gadaRebis Semdgom da erTwlian bunebrivad dawmendil RvinomasalebSi. cdis Sedegebi warmodgenilia cxrili 2.4.2.1 saxiT.

cxrili 2.4.2.1

ε-viniferinis raodenobrivi cvlileba (mg/l) bunebrivad naxevradtkbil RvinomasalebSi

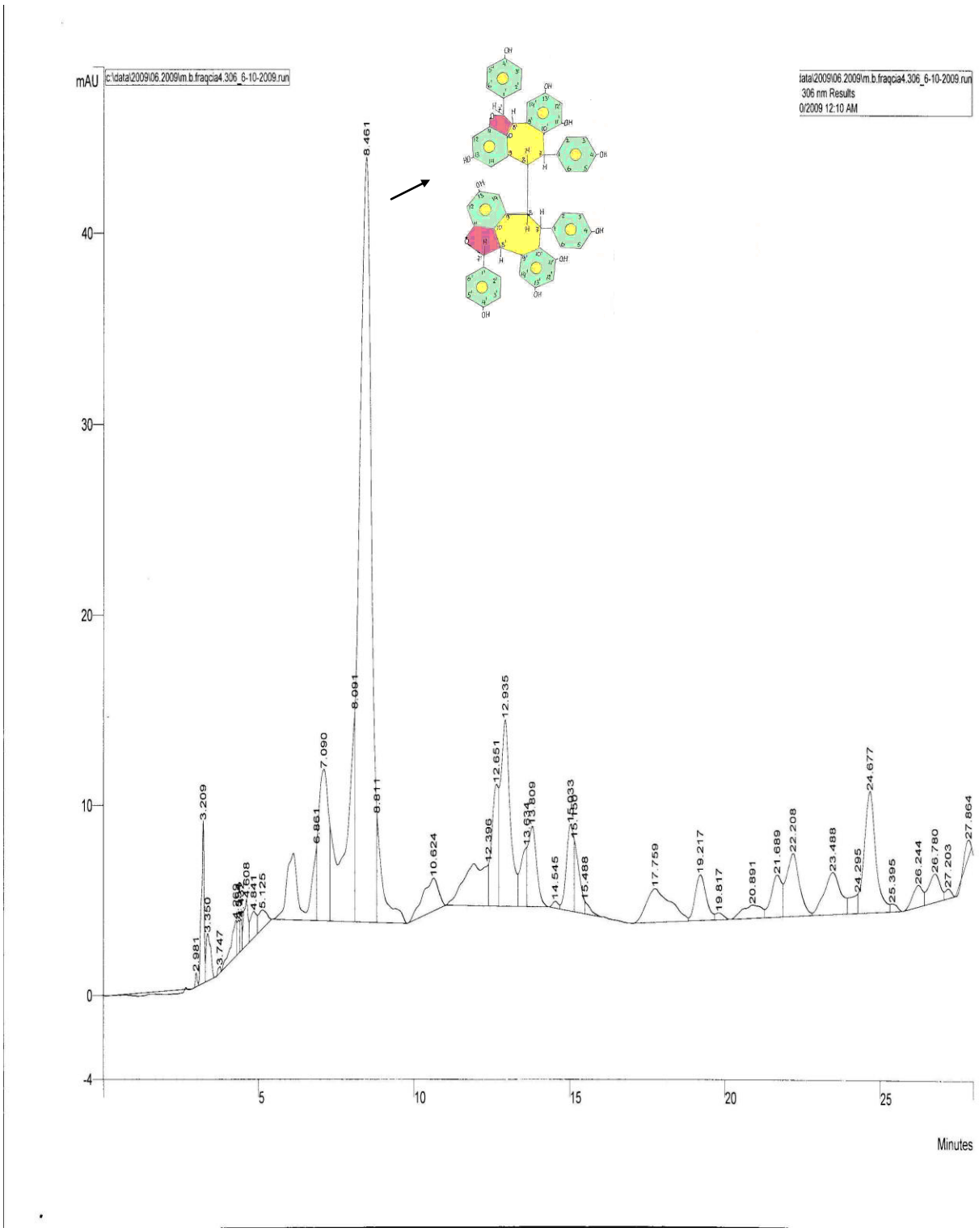
Rvinomasalis dasaxeleba	sawyisi	6-Tviani	12-Tviani	sxvaoba
sakontrolo				
saferavi-axaSeni	**1.45**	**1.27**	**0.91**	**0.54**
saferavi-qinZmarauli	**0.92**	**0.83**	**0.66**	**0.26**
ojaleSi	**0.90**	**0.63**	**0.53**	**0.68**
aleqsandrouli	**1.10**	**0.79**	**0.42**	**0.58**
mujureTuli	**0.60**	**0.49**	**0.30**	**0.30**
pasterizebuli				
saferavi-axaSeni	**1.25**	**0.85**	**0.68**	**0.57**
saferavi-qinZmarauli	**0.79**	**0.66**	**0.49**	**0.30**
ojaleSi	**0.73**	**0.58**	**0.39**	**0.34**
aleqsandrouli	**0.78**	**0.56**	**0.35**	**0.43**
mujureTuli	**0.53**	**0.44**	**0.25**	**0.28**

eqsperimentis Sedegad gamovlinda pasterizaciis gavlena bunebrivad naxevradtkbil RvinomasalebSi ε-viniferinis koncentraciaze. misi sawyisi koncentracia pasterizaciis gavleniT mcirdeba da es procesi ufro intensiuri xdeba erTwliani formirebis periodSi arapasterizirebul _ sakontrolo RvinomasalebTan SedarebiT. Eeqsperimentis Sedegebi miuTiTebs maszed, rom pasterizacia ganapirobebs ε-viniferinis Semcirebis intensifikacias. pasterizebul RvinomasalebSi ε-viniferinis Semcireba iwyeba TviT pasterizaciis procesSi da grZeldeba Rvinomasalis formirebis periodSi.

mag. axaSnis RvinomasalisTvis 1.45_1.25 mg/l anu Semcirebuli raodenoba tolia 0.2 mg/l. qinZmaraulisTvis 0.92_0.79 mg/l anu Semcirebuli raodenoba tolia 0.13 mg/l. ojaleSisTvis 0.9_0.73 mg/l e.i. Semcirda 0.17 mg/l_iT. aleqsandroulisTvis 1.1_0.78 mg/l anu Semcirda 0.32 mg/l_iT. mujureTulisTvis 0.6_0.53 mg/l e.i. Semcirda 0.07 mg/l_iT.

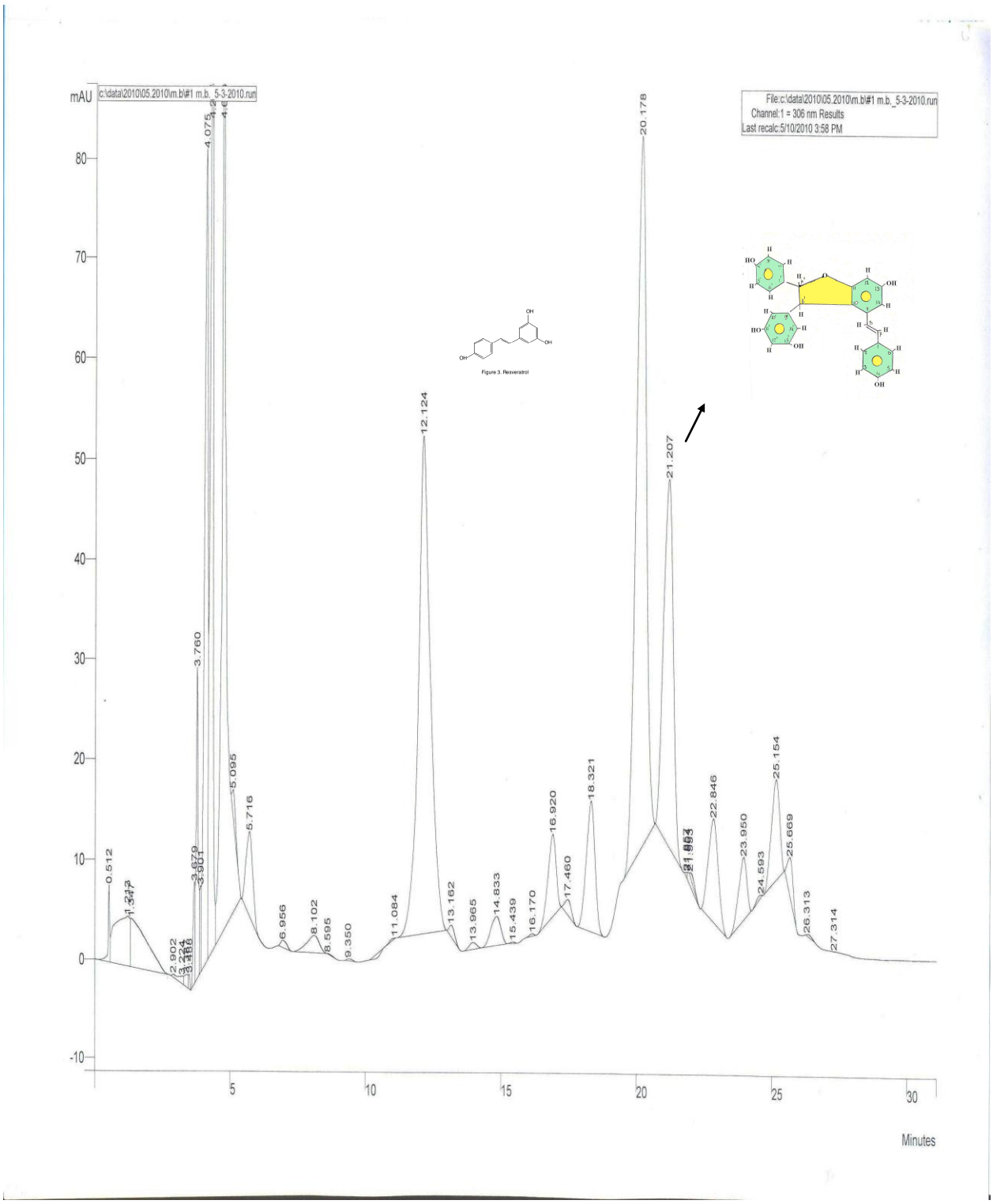
pasterizaciis procesSi Semcirebuli ε-viniferinis koncentracia kvlav ganagrZobs Semcirebas formirebis periodSi da, cxadia, gansxvavebulia arapasterizebulad formirebul RvinoebSi arsebuli ε-viniferinis koncentraciisagan.

sufris mSrali da bunebrivad naxevradtkbili Rvinomasalebis formirebis periodSi ε-viniferinis raodenobrivi Semcirebis asaxsnelad sayuradRebo aRmoCnda Txelfenovan qromatogramaze dafiqsirebuli mzardi laqa. igi diazotirebuli sulfanilis mJaviT ifereba moyavisfrod da damaxasiaTebeli ganawilebis koeficienti Rf=0,45. am monacemebiT msgavsi aRmoCnda tetrameruli stilbenisa. Semdeg am laqis Sesabamisi nivTiereba preparatulad gamovyaviT saferavis erTwliani formirebis mSrali da bunebrivad naxevradtkbili Rvinoebidan da SevadareT individualur tetramerul stilbens ultraiisfer ubanSi STanTqmis speqtriT. Mmaqsimumebi aRmoCnda 227nm, 283nm da 310nm talRis sigrZeze. identificirebuli tetrameruli stilbeni saintereso aRmoCnda siTxuri qromatografiis TvalsazrisiT, romliTac naTlad dadasturda am nivTierebis mcire koncentracia yurZnis kanebSi, duRilis dasasruls da gazrdili raodenoba formirebul RvinoSi. Ees ki miuTiTebs tetrameruli stilbenis, rogorc gardaqmnis produqtis warmoqmnaze Rvinomasalebis formirebisas.

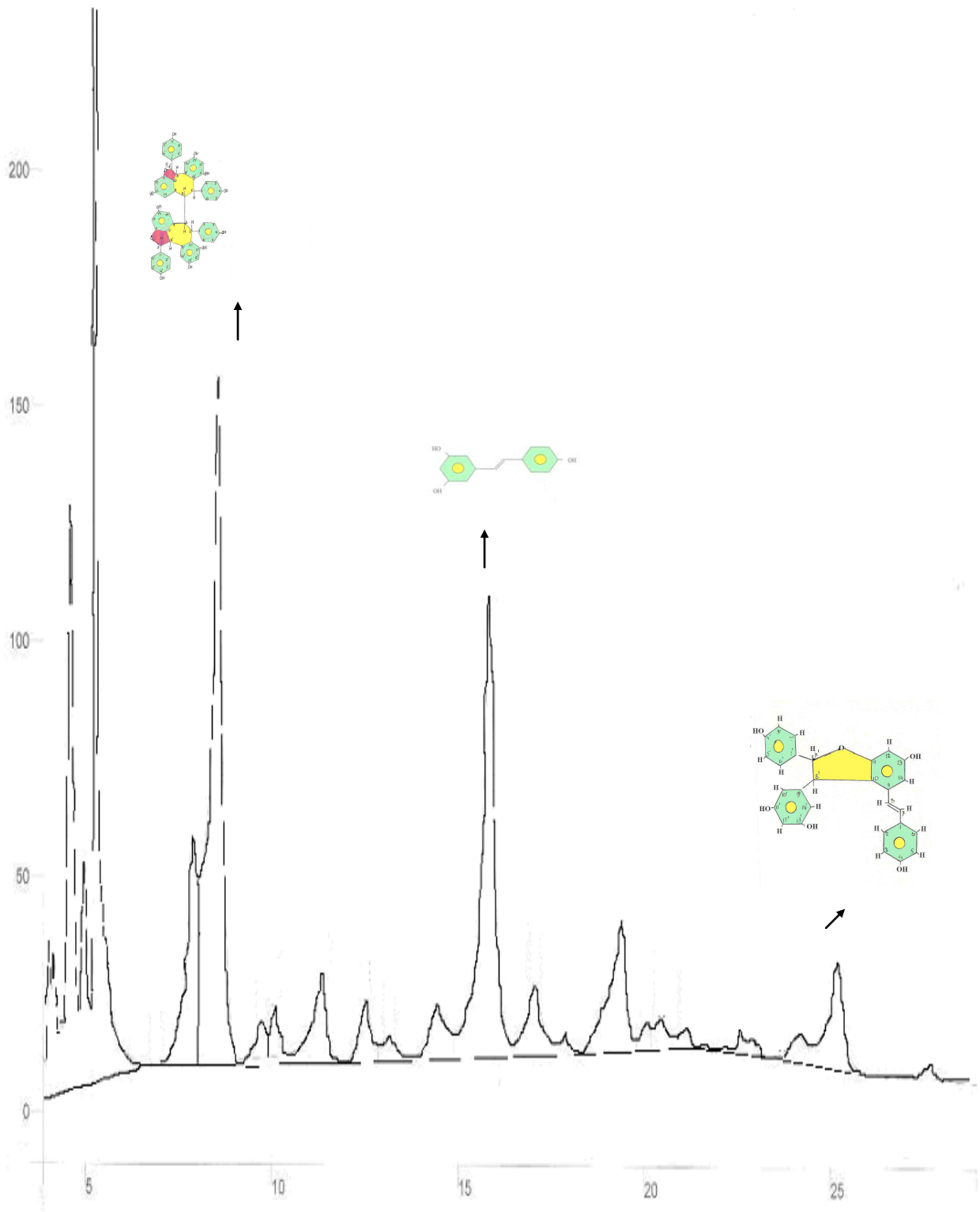


nax. 2.4.2.a individualuri tetrameruli stilbenis siTxuri qromatograma

$C_{58}H_{42}O_{12}$



nax. 2.4.2.b-saferavis yurZnis kanis stilbenSemcveli fraqciis siTxuri qromatograma



nax. 2.4.2.g-saferavis mSrali Rvinis siTxuri qromatograma

qromatograma gviCvenebs tetrameruli stilbenis Sekavebis dros – RT=8,3wT. yurZnis kanebis siTxuri qromatogramebidan gamomdinare tetrameruli stilbenis qromatografiuli maxasiaTeblebi da raodenobrivi Semcvelobani warmodgenilia cxrili 2.4.2.2. saxiT.

cxrili 2.4.2.2.

tetrameruli stilbenis qromatografiuli maCveneblebi da koncentracia yurZnis kanebSi, mg/100g

obieqtis dasaxeleba	RRT_ rezveratrolis mimarT	S_pikis farTobi	tetrameris koncentracia
1.saferavi (axaSeni)	0,58	116078	0,0134
2.saferavi (kardenaxi)	0,60	43609	0,004
3.saferavi (qinZmarauli)	0,59	35162	0,005
4.saferavi (winandali)	0,58	308553	0,073
5.saferavi budeSurisebri	0,60	104588	0,025
6.kaberne sovinioni	0,58	168901	0,029
7.ocxanuri safere	0,59	159994	0,033
8.ojaleSi	0,60	513817	0,130
9.aladasturi	0,60	842413	0,177
10.aleqsandrouli	0,60	73379	0,021
11.mujureTuli	0,59	64828	0,011
12.Cxaveri	0,60	16565	0,003
13.asureTuli Savi	0,60	128047	0,025

eqsperimentuli Sedegebi naTlad asaxaven tetrameruli stilbenis mcire koncentracias yurZnis kanebSi. Aam TvalsazrisiT sacdel obieqtebs Soris gamoirCeva ojaleSis da aladasturis

yurZnis kanebi, tetrameruli stilbenis SedarebiT maRali koncentraciiT. Cxaveris yurZnis kani ki tetrameruli stilbenis yvelaze mcire SemcvelobiT xasiaTdeba.

Aamgvarad, eqsperimentis Sedegad dadasturda, rom rogorc sufris mSrali, ise bunebrivad naxevradtkbili Rvinomasalebis formirebisas adgili aqvs ε-viniferinis raodenobriv Semcirebas da misi dimerizaciis produqtis - tetrameruli stilbenis - warmoqmnas. am gardaqmnis intensifikacias axdens pasterizacia (cxlad Camosxma). AamasTan dakavSirebiT aucilebelia aRvniSnoT, rom, radgan tetrameruli stilbeni ufro maRali antioqsidantobis matarebelia, vidre misi winamorbedi ε-viniferini da trans-rezveratroli, amitom wiTeli Rvinis zemoT aRniSnuli raodenobrivi cvlilebiT ar icvleba stilbenoidebis wilad mosuli Rvinis antioqsidanturi aqtivoba.

2.4.3. postfermentuli maceraciis optimaluri parametrebis dadgena stilbenebiT gamdidrebuli sufris mSrali wiTeli Rvinoebis dasamzadeblad

winamdebare sadisertacio naSromis eqsperimentuli monacemebidan gamomdinare, biologiurad aqtiuri stilbeni ε-viniferini da tetrameruli stilbeni wyalSi xsnadi nivTierebebia trans-rezveratrolTan SedarebiT. es Tviseba ganapirobebs maT Soris arsebul gansxvavebas alkoholur duRilSi dagrovebis dinamikis mixedviT. dadgenilia, rom trans-rezveratroli ver aswrebs yurZnis kanidan srul eqstraqcias da mas narCeni saxiT Seicavs wiTeli yurZnis daduRebuli WaWa (koxtaSvili,2006). narCeni trans-rezveratrolis gamoyenebis mizniT amave avtoris mier SemuSavebulia specialuri sadeserto wiTeli Rvinis damzadebis teqnologia.

stilbenebis zemoaRniSnuli Tvisebebis gaTvaliswinebiT da, zogadad, fenoluri nivTierebebis maqsimaluri gamowvlilvis mizniT, maRali antioqsidanturi aqtivobis matarebeli, sufris mSrali wiTeli Rvinoebis dasamzadeblad, mizanSewonilad miviCnieT postfermentuli maceraciis gamoyeneba.

teqnologiuri procesis warmarTvisaTvis gamoviyeneT winandalSi gavrcelebuli saferavis da kaberne-sovinionis jiSis, 2010 wlis mosavlis yurZeni. sakontrolo da sacdeli variantebi CavatareT paralelurad, erTnair pirobebSi: erTidaimave nedleulis uklerto durdo davaduReT mSralad 28–30 ^{0}C temperaturaze 8 dRe-Ramis ganmavlobaSi, ris Semdegac daduRebuli Rvinomasala erT-erT WurWelSi WaWidan movxseniT, sakontrolo variantis saxiT. sacdeli variantis Rvinomasala ki WaWasTan erTad, savse WurWelsa da hermetul pirobebSi davayovneT 25–27^{0}C temperaturaze. saanalizod nimuSs viRebdiT 5 dRis SualediT da vsazRvravdiT saerTo fenolebs, stilbenebs, saerTo saRebavebs da oligomerul proantocianidinebs. 15 dRiani dayovnebis Semdeg, Rvinomasalebi ganvacalkeveT WaWidan TviTnadeni da

nawnexi fraqciebis saxiT.; ganvsazRvreT miRebuli da sakontrolo Rvinomasalebis fizikur-qimiuri maxasiaTeblebi. cxrili 2.4.3.1

cxrili 2.4.3.1.

sakontro.lo da postfermentuli Rvinomasalebis fizikur-qimiuri maCveneblebi

qimiuri maCveneblebi	saferavi sakontrolo	saferavi saeqsperimento	kaberne sakontrolo	kaberne saeqsperimento
alkoholi, moc %	13.2	13.2	11.5	11.5
titruli mJavianoba, g/l	7.0	7.0	6.7	6.7
mqrolavi mJavianoba,g/l	0.33	0.38	0.33	0,38
Saqris masuri wili,%	0.2	0.15	0.25	0.2
eqstraqti,g/l,	28.6	29.3	25.1	26.0

saeqsperimento Rvinomasalebi ramdenime variantis saxiT davayovneT bunebrivi dawmendisaTvis. varianti - I - TviTnadeni fraqcia; varianti - II - TviTnadeni+nawnexi fraqcia. dadginda, rom postfermentul periodSi Rvinomasalis gamdidreba tetrameruli stilbeniT xorcieldeba WaWaSi arsebuli wipwis eqstraqciis safuZvelze. aseve, rogorc mosalodneli iyo, moxda Rvinomasalis gamdidreba wipwis oligomeruli proantocianidinebiT; xolo saRebavi nivTierebebis koncentraciis mateba, TavisTavad, yurZnis kanSi arsebuli antocianebis eqstraqciis Sedegia. Sedegebi warmodgenilia cxril 2.4.3.2 da 3 saxiT.

cxrili 2.4.3.2.

fenolur naerTTa cvalebadoba postfermentuli maceraciis periodSi

komponentebi	saferavi	kaberne sovinioni
	xangrZlivoba, dRe-Rame	

	5	10	15	5	10	15
saerTo fenolebi, g/l	**4,9**	**5,7**	**6,7**	**4,3**	**4,8**	**5,5**
oligomeruli proantocianidinebi, mg/l	**320**	**510**	**770**	**250**	**380**	**489**
saerTo saRebavebi, mg/l	**885**	**940**	**1030**	**710**	**867**	**956**
trans_rezveratroli, mg/l	**3,7**	**4,3**	**4,6**	**1,8**	**2,4**	**2,9**
ε_viniferini, mg/l	**1,4**	**1,42**	**1,42**	**0,9**	**0,91**	**0,91**
tetrameruli stilbeni, mg/l	**0,64**	**1,18**	**2,15**	**0,45**	**0,95**	**1,75**

eqsperimentis Sedegebi gviCvenebs, rom saferavis da kaberne- sovinionis durdos postfermentuli 15-dRiani periodis ganmavlobaSi mimdinareobs yvela saZiebeli fenoluri naerTis garkveuli raodenobrivi cvalebadoba. sainteresoa ε-viniferinis umniSvnelo cvlileba, romelic SeiZleba aixsnas misi wyalSi kargi xsnadobiT da fermentaciis procesSi durdodan sruli gamowvlilviT. eqsperimentis Sedegebidan gamomdinare, gamokleva moiTxova tetrameruli stilbenis mniSvnelovanma raodenobrivma matebam postfermentul periodSi. wina paragrafebSi ganxiluli eqsperimentebis mixedviT, sufris mSral da bunebrivad naxevradtkbil RvinoebSi tetrameruli stilbeni, ZiriTadad, warmoadgens ε-viniferinis dimerizaciis produqts erTwliani formirebisas. yurZnis kanebSi igi mcire raodenobiT dafiqsirda. postfermentul periodSi ε-viniferinis koncentracia TiTqmis ucvlelia, magram, amavdroulad, tetrameruli stilbeni mniSvnelovnad matulobs. udaoa, rom mis wyaros warmoadgenda WaWa da, am mosazrebis dasadastureblad, calke SeviswavleT saferavis mSralad daduRebuli wipwa (rogorc sufris mSrali Rvinoebis warmoebis narCeni).

davamzadeT misi wyal-spirtiani eqstraqti da Txelfenovani qromatografiiT SevadareT yurZnis kanis da Rvinis stilbenSemcvel fraqciebs, vazis anasxlavis stilbenSemcvel eqstraqts da individualur tetramerul stilbens. saidentifikacio analizebis Sedegad wipwis eqstraqtSi dafiqsirda tetrameruli stilbeni. Catarebuli kvlevis Sedegebi miuTiTebs masze, rom postfermentul periodSi Rvinomasalis gamdidreba tetrameruli stilbeniT xorcieldeba WaWaSi arsebuli wipwis eqstraqciis safuZvelze.

rogorc zemoT aRvniSneT, damzadebuli Rvinomasalebi formirebisaTvis movaTavseT daxurul WurWelSi da, sakontrolo variantebis paralelurad, vakvirdebodiT erTwliani formirebis periodSi TviTdawmendil mdgomareobaSi, teqnologiuri damuSavebis gareSe. Eeqsperimentis Sedegebi mocemulia cxrili 2.4.3.2-saxiT.

stilbenebis Semcvelobis cvalebadoba postfermentuli maceraciiT damzadebul sufris mSral RvinomasalebSi maTi formirebis periodSi

Rvinomasala	trans-rezveratroli, mg/l		ε-viniferini, mg/l		tetrameruli stilbeni, mg/l	
	sawyisi	formirebuli	sawyisi	formirebuli	sawyisi	formirebuli
saferavi						
sakontrolo	2.63	2.25	1.43	0.81	0.35	1.28
xangrZlivi maceraciiT:						
TviTnadeni	4.6	3.7	1.46	0.95	2.15	2.65
TviTnadeni +nawnexi	4.9	3.9	1.42	0.91	2.21	2.92
kaberne-sovinioni						
sakontrolo	1.6	1.1	0.88	0.41	0.19	0.9
xangrZlivi maceraciiT:						
TviTnadeni	2.9	2.33	0.91	0.43	1.75	2.28
TviTnadeni +nawnexi	2.94	2.39	0.89	0.42	1.79	2.27

Sedegebi gviCvenebs, rom, stilbenebis Semcvelobis TvalsazrisiT, sakontrolo Rvinomasalebi da postfermentuli maceraciiT damzadebuli Rvinomasalebi mniSvnelovnad gansxvavdeba erTmaneTisagan, kerZod, maceraciis Sedegad ufro meti raodenobis stilbenebi gamoiwvlileba. cxadia, sawyis variantebSi, maTi raodenobebi gansxvavebulia, rac vazis jiSuri TaviseburebebiT aixsneba. sayuradReboa is faqtic, rom xangrZlivi maceraciis TviTnadeni fraqciis da TviTnadeni + nawnexi fraqciebis SereviT damzadebuli Rvinomasalebi erTmaneTisagan mcired gansxvavdeba. Ees ki unda avxsnaT teqnologiuri procesisas RvinomasalaSi lokalizebuli xsnadi fenoluri nivTierebebis eqstraqciis maRali xarisxiT; rogorc sakontrolo, aseve, postfermentuli maceraciiT damzadebul RvinomasalebSi, formirebis periodi stilbenebis cvlilebebis erTnairi kanonzomierebiT xasiaTdeba. kerZod, trans-rezveratrolis da ε-viniferinis koncentraciebi mcirdeba, tetrameruli stilbenis Semcveloba ki izrdeba; saWiroa aRiniSnos, rom postfermentuli maceraciiT damzadebuli Rvinoebi sakontrolosgan gansxvavdeba aramarto stilbenebis, aramed, rogorc mosalodneli iyo, zogadad, fenoluri naerTebis maRali koncentraciiT. Ees ki, Tavismxriv, amgvaraddamzadebuli Rvinoebis maRal antioqsidantur aqtivobaze miuTiTebs, rac ganapirobebs maT maRal samkurnalo-profilaqtikur Rirebulebas. Psakvlevi RvinoebisTvis postfermentuli maceraciis optimalur parametrebad gamovlinda: hermetuloba, xangrZlivoba - 15 dRis intervali, temperatura – 25–27^{0}C.

amgvarad, zemoaRniSnulidan gamomdinare, mizanSewonili da rekomendirebulia, samkurnalo-profilaqtikuri daniSnulebiT gamiznuli wiTeli Rvinoebi damzaddes postfermentuli maceraciis gamoyenebiT.

2.5. trans-rezveratrolis da misi warmoebulebis _ dimeruli ε - viniferinis da tetrameruli stilbenis _ koncentraciebi qarTul wiTel RvinoebSi

trans-rezveratrolis da misi warmoebulebis _ dimeruli ε-viniferinis da tetrameruli stilbenebis _ kvlevis Sedegad qarTul wiTel RvinoebSi gamovlinda jiSuri Tavisebureba, saferavis adgilwarmoSobis da Rvinomasalebis teqnologiuri damuSavebis faqtorebi, rac naTlad aisaxeba bunebrivad dawmendili saeqsperimento Rvinoebis da qarxnuli wesiT damzadebuli komerciuli Rvinoebis Sedarebisas (cxr. 2.5.1.).

cxrili 2.5.1.

stilbenebis Semcveloba (mg/l) qarTul wiTel RvinoebSi

eqsperimentuli erTwliani	trans-rezveratroli	ε-viniferini	tetrameruli stilbeni
sufris mSrali			
1.saferavi (kardenaxi)	2,56	0,81	1,22

2.saferavi (winandali)	2,13	0,88	1,92
3.saferavi (nafareuli)	2,35	0,78	1,59
4. saferavi budeSurisebri	2,01	0,63	0,84
5.kaberne-sovinioni	1,26	0,52	0,96
6.ocxanuri safere	2,23	0,65	1,12
7. aladasturi	2,03	0,42	1,95
8. asureTuli Savi	0,9	0,51	0,75
9. Cxaveri	0,51	0,11	0,31
bunebrivad n/tkbili			
1.saferavi (axaSeni)	2,21	0,91	1,52
2.saferavi (qinZmarauli)	1,87	0,66	1,32
3. ojaleSi	2,05	0,53	1,87
4. aleqsandrouli	1,65	0,42	0,8
5. mujureTuli	1,12	0,3	0,53
komerciuli Rvinoebi:			
1."mukuzani" - mSrali	2,14	0,52	1,5
2."qinZmarauli" - bun.n/tkb	1,5	0,41	1,01
3."Sumi" mSrali	1,6	0,53	1,65
4 "Sumi" bun.n/tkb	1,21	0,38	0,93
5."xvanWkara" - bun.n/tkb	0,9	0,32	0,62
6."qarTuli nadimi" - mSrali	1,7	0,55	1,37
7."qarTuli nadimi" - b. n/tkb	1,4	0,49	1,11
8. "alaznis veli" – bun .n/tkb	1,3	0,45	1,04
9. "bioRvino" - saferavi, samwliani TviTdawmendili	1,85	0,27	1,74

qarTul wiTel RvinoebSi (eqsperimentulSic da komerciulSic) dafiqsirda saZiebeli stilbenebis erTnairi ganawileba. dominantia trans-rezveratroli, masze mniSvnelovnad naklebia ε-viniferini, romelsac Warbobs misi dimerizaciis produqti _ tetrameruli stilbeni. saferavis adgilwarmoSobis mixedviT _ winandalSi gavrcelebuli saferavis Rvino xasiaTdeba naklebi trans-rezveratroliT, magram ε-viniferinis da tetrameruli stilbenis maRali koncentraciiT. es faqti miuTiTebs winandlis saferavis RvinomasalaSi ε-viniferinis intensiur dimerizaciaze; dadgenilia Rvinomasalebis teqnologiuri damuSavebis gavlena trans-rezveratrolis da ε-viniferinis koncentraciis garkveulwilad Semcirebaze. es faqtori asaxulia komerciul RvinoebSi stilbenebis Semcirebul raodenobriv maCvenebelze, rac teqnologiuri damuSavebis Sedegia. aRvniSnavT, rom Rvinomasalebi (garda bioRvinisa) damuSavebuli iyo cxoveluri Txevadi JelatiniT (7-8

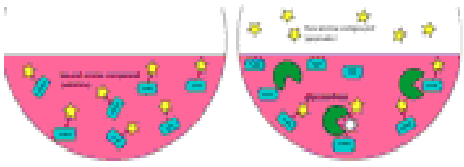
dRiani dayovnebiT), leqidan Semdgomi moxsniT filtraciis meSveobiT da Semdeg siciviT damuSavebiT _ 4^0 C-ze. zemoaRniSnulis dadasturebaa, aseve, TviTdawmendil, samwlian bioRvinoSi ε-viniferinis intensiuri dimerizacia da tetrameruli stilbenis maRali koncentraciiT SenarCuneba saferavisgan damzadebul sxva RvinoebTan SedarebiT.

2.6. ε-viniferinis da zogierTi fenoluri naerTis gavlena vaSl-rZemJava duRilze sufris mSral wiTel RvinomasalebSi

yurZnis da Rvinis stilbenoidebis da sxva fenoluri naerTebis biologiuri aqtivobebis kvleva gvainteresebs ara marto janmrTelobis kuTxiT, aramed TviT Rvinis damzadebis etapebze Sesabamisi mikroorganizmebis mimarT gamovlenili aqtivobebis TvalsazrisiTac. durdos alkoholuri duRilis procesSi, calkeuli fenoluri naerTi Taviseburi qceviT xasiaTdeba Rvinis safuarebTan mimarTebaSi. gamokvleulia trans-rezveratrolis gavlena Rvinis safuarebze Sacch.vini-kaxuri-42 da Sacch.chodati-Teliani 79. dadgenilia trans-rezveratrolis mastimulirebeli zemoqmedeba aRniSnuli safuarebis zrda-ganviTarebaze (koxtaSvili da sxv.1999; beJuaSvili da sxv. 2010). alkoholur duRilSi gardaqmnebs ganicdian yurZnis magari nawilebis lignini, fenolmJavebi da fenolaldehidebi. Rvinis safuarebis zemoqmedeba ligninis gvaiaciluri da siringiluri struqturuli erTeulebis mimarT Semdegi TanmimdevrobiT gamoixateba: Sacch.oviformis > Sacch.vini > Sacch.chodati > Sacch.uvarum. pirokatexinuri da 4-oqsifeniluri struqturebisTvis Tanmimdevroba aseTia: Sacch.oviformis > Sacch.vini > Sacch.uvarum > Sacch.chodati (beJuaSvili da sxv. 2000). flavonoidebi – kvercitrini, ruTini, kvercetini da dihidrokvercetini _ alkoholuri duRilis procesSi ganicdian Rvinis safuarebis zemoqmedebiT gamowveul gardaqmnebs. kvercitrini da ruTini warmoqmnis kvercetins, xolo kvercetini da dihidrokvercetini nawilobriv gardaiqmneba axal nivTierebebSi. Rvinis safuarebidan: Sacch.vini-kaxuri42, Sacch.vini-rqawiTeli 61, Sacch.chodati, Sacch.oviformis, - SedarebiT dabali efeqturobiT xasiaTdeba Sacch.chodati (beJuaSvili da sxv. 2008; Sonia da sxv. 2009).

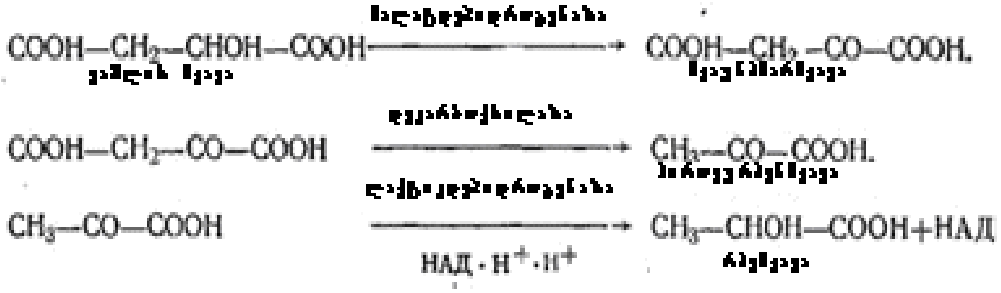
Rvinis formirebaSi mniSvnelovan rols asrulebs vaSl-rZemJava duRili, romlis sworad warmarTva da Sualeduri produqtebisgan dacva maRalxarisxovani Rvinis sawindaria. vaSl-rZemJava duRilis sqema gviCvenebs, rom es procesi safexurovania. pirvel safexurze malatdehidrogenazas moqmedebiT vaSlmJava gardaiqmneba mJaunZmarmJavad. meore safexurze am ukanasknelidan dekarboqsilazas moqmedebiT miiReba piroyurZenmJava, romlisganac laqtikdehidrogenazas moqmedebiT warmoiqmneba rZemJava. aRniSnuli procesis balansi yovelTvis darRveulia - produqtTa gamosavlianoba ar Seesabameba nakleb praqtikul

gamosavals. es ki ganpirobebulia Tanauri produqtebis warmoqmniT, rogoricaa diacetili, acetoini, ZmarmJava. zemoaRniSnulidan gamomdinare, kvlevis mizans Seadgenda biologiurad aqtiuri zogierTi stilbenis da, maTTan Sedarebis mizniT, zogierTi flavonoidis da fenolmJavis gavlenis dadgena vaSl-rZemJava duRilze.



ვაშლრძემჟავა
დუღილის
მექანიზმი

$$COOH-CH_2-CHOH-COOH \rightarrow CH_3-CHOH-COOH + CO_2.$$



vaSl-rZemJava duRili CavatareT saferavisgan damzadebul sufris mSral RvinomasalaSi trans-rezveratrolis da ε-viniferinis damatebiT da bunebrivad - maTi Setanis gareSe. duRili vawarmoeT rZemJava baqteriebis mSrali preparatiT “inoflor R’. modeluri vaSl-rZemJava duRili, aseve, CavatareT igive preparatiT da stilbenebis paralelurad gamoviyeneT: flavonoidebidan-kvercetini, (+)katexini, (-)epikatexini; fenolkarbonmJavebidan - yavis da ferulis mJavebi. rZemJavis warmoqmnas vakvirdebodiT Tvisebrivad, qaRaldis qromatografiis meTodiT. organuli mJavebi raodenobrivad ganvsazRvreT siTxuri qromatografiis meTodiT Semdeg pirobebSi: qromatografi - “Varian”, sveti- Supelsol C 18-DB, 25cmx4,6mm; eluentebi: A-0,1% H_3PO4 +1%meTanoli; B-meTanoli; gradientuli reJimi B eluentis mixedviT. analizis xangrZlivoba 15wT. deteqtireba UV/Vis deteqtoriT 215 nm talRis sigrZeze.

sawyis RvinomasalaSi trans-rezveratrolis da ε-viniferinis gansxvavebuli koncentraciis gamo, miuxedavad maTi tolo raodenobiT damatebisa, meoradi duRilis dros trans-rezveratrolis raodenoba RvinomasalaSi Seadgenda 3,2 mg, xolo ε-.viniferinis 2,5 mg. vaSl-rZemJava duRiliT

gamowveul cvlilebebze miuTiTebs cxrili 2.6.1 monacemebi. sawyisi Rvinomasalis pH-3,1 gaizarda 3,45-mde, rac adasturebs RvinomasalaSi aqtiuri mJavianobis Semcirebas. Ees, upirveles yovlisa, gamowveulia vaSlmJavis gardaqmniT erTfuZian rZemJavaSi. sakontrolosTan SedarebiT, stilbenebdamatebul variantebSi SedarebiT meti darCa vaSlmJava da meti warmoiqmna rZemJava. es efeqti trans-rezveratrolis SemTxvevaSi ufro mkafioa, ε-viniferinTan SedarebiT. sayuradReboa is, rom Tavisufali Rvinis mJava garkveulwilad gardaqmnas ganicdis da sakontrolosTan SedarebiT, stilbenoidebis gavlena aqac SeimCneva: trans-rezveratrolis SemTxvevaSi Rvinis mJava mcirdeba 0,11 g/l-iT, xolo ε-viniferinis SemTxvevaSi 0,23 g/l-iT. vaSl-rZemJava duRilis Sedegad adgili aqvs mqrolavi mJavianobis matebas. kerZod, trans-rezveratrolis SemTxvevaSi mqrolavi mJavianoba izrdeba 0,04 g/l-iT, xolo ε-viniferinis SemTxvevaSi 0,07 g/l-iT.

stilbenebis gavlenas vaSl-rZemJava duRilze adasturebs modeluri duRilis Sedegebic (cxrili 2.6.2). sakontrolosTan SedarebiT, stilbenebis, flavonoidebis da fenolmJavebis Tanaobisas, vaSlmJava SedarebiT meti raodenobiT rCeba gardauqmneli. amave dros, trans-rezveratrolis Tanaobisas vaSlmJava rCeba meti, magram rZemJavac meti warmoiqmneba. naklebi raodenobiT rZemJava miiReba (-) epikatexinis, yavis da ferulis mJavebis Tanaobisas.

cxrili 2.6.1

organul mJavaTa cvalebadobis Tavisebureba vaSl-rZemJavuri duRilisas saferavis sufris mSral RvinomasalaSi

cdis variantebi	pH	vaSlmJava dasawyisSi g/l	vaSl mJava bolos g/l	rZe mJava g/l	Rvinis mJava g/l	mqrolavi mJavianoba g/l
1.Rvinomasala+preparati (sakontrolo)	3,4	3.2	2,19	1,18	2,44	0,46
2.Rvinomasala+preparati+ trans-rezveratroli	3,45	3.2	2,27	1,25	2,33	0,50
3.Rvinomasala+preparati+ ε-viniferini	3,45	3.2	2,23	1,21	2,21	0,53

cxrili 2.6.2

organul mJavaTa cvalebadobis Tavisebureba modelur vaSl-rZemJava duRilSi

cdis variantebi	vaSlmJava g/l-dasawyisSi-bolos	warmoqmnili rZemJava g/l	RvinismJava g/l
1.sakontrolo (vaSlmJava+preparati)	3,1 _ 1,98	0,14	____
2.vaSlmJava+preparati+ trans-rezveratroli	3,1 _ 2,34	0,16	____
3.vaSlmJava+preparati+ ε-viniferini	3,1 _ 2,06	0,15	____
4.vaSlmJava+preparati+ kvercetini	3,1 _ 2,08	0,10	____
5.vaSlmJava+preparati + (+)kateqini	3,1 _ 2,08	0,09	____
6.vaSlmJava+preparati + (−)epikateqini	3,1 _ 2,10	0,05	____
7.vaSlmJava+preparati+ yavis mJava	3,1 _ 2,10	0,08	____
8.vaSlmJava+preparati+ ferulis mJava	3,1 _ 2,10	0,05	____

Catarebuli eqsperimentis DSedegad gamovlinda stilbenebidan- trans-rezveratrolis da ε-.viniferinis garkveuli efeqti vaSl-rZemJava duRilze sufris mSral wiTel RvinomasalaSi. es nivTierebebi vaSlmJavidan rZemJavis warmoqmnas astimulireben SedarebiT naklebi Sualeduri produqtebis warmoqmniT. stilbenebTan SedarebiT nakleb efeqturi aRmoCnda kvercetini,

(+)katexini, (-)epikatexini, yavis da ferulis mJavebi. stilbenebis Tanaobisas vaSl-rZemJava duRilis Sedegad dafiqsirda Tavisufali Rvinis mJavis Semcireba da mqrolavi mJavianobis mateba.

miRebuli Sedegebi miuTiTebs masze, rom saferavis sufris mSral RvinomasalaSi trans-rezveratrolis da ε-.viniferinis gazrdili koncentracia garkveul gavlenas axdens vaSl-rZemJava duRilze, maSin roca maTi bunebrivi koncentracia uaryofiTad ar moqmedebs Rvinomasalis xarisxze.

Aamgvarad, eqsperimentis Sedegebi safuZvels gvaZlevs Semdegi rekomendaciis SeTavazebisaTvis: wiTeli Rvinoebis individualuri stilbenebiT gamdidrebis saWiroebis SemTxvevaSi, maTi xelovnurad damateba mizanSewonilia vaSl-rZemJavuri duRilis Catarebis Semdeg.

2.7. vazis jiSuri Taviseburebani qarTuli wiTeli Rvinoebis fenoluri speqtris mixedviT da antioqsidanturi aqtivoba

K kvlevis obieqtebs warmoadgenda Cven mier damzadebuli, bunebrivad dawmendili sxvadasxva tipis wiTeli Rvinoebi, romlebic xasiaTdeboda maRali organoleptikuri da xarisxobrivi maCveneblebiT (cxr.2.7.1) analizis Sedegad, maTi fenoluri speqtri erTmaneTisagan gansxvavebuli aRmoCnda, rac jiSuri Taviseburebebis gamovlinebad unda CaiTvalos. gansxvaveba dafiqsirda, aseve, Rvinis tipis mixedviT, rac Rvinis teqnologiis Sedegia. jiSuri Tavisebureba aisaxeba rogorc sufris mSral, aseve bunebrivad naxevradtkbil wiTel RvinoebSi. sufris mSral Rvinoebs Soris fenoluri nivTierebebis maRali koncentraciiT gamoirCeva saferavi da ocxanuri safere. Bbunebrivad naxevradtkbil wiTel Rvinoebs Soris gamoirCeva ojaleSi. Pproantocianidinebis Semcvelobis mixedviT, yvela saeqsperimento nimuSSi fiqsirdeba erTnairi kanonzomiereba _ polimeruli proantocianidinebi raodenobrivad Warbobs oligomerul proantocianidinebs. Uunda aRiniSnos, rom es kanonzomiereba damaxasiaTebeli maCvenebelia vazis wiTelyurZniani teqnikuri jiSebidan damzadebu.li RvinoebisaTvis (beJuaSvili da sxv. 2008). Ffenolur naerTTa jgufebi gansxvavebuli raodenobiT fiqsirdeba.

maT Soris gamonaklisi arc fenolkarbonmJavebi da fenolaldehidebia, romelTa gansxvavebuli intensivobis qromatografiuli laqebi maT gansxvavebul koncentraciaze miuTiTebs. Yyovelive zemoaRniSnulis dadasturebaa cxr. **2.7.1 da 2**-is monacemebi.

cxrili 2.7.1.

fenolur naerTTa Semcveloba sxvadasxva tipis wiTel RvinoebSi

dasaxeleba	saerTo fenolebi g/l	oligomeruli proantocianidinebi mg/l	saRebavi n-bi mg/l	polimeruli proantocianidinebi mg/l	kateqinebi mg/l
1. saferavi- sufris mSrali	4,9	988	800	3200	456
2. kaberne-sufris mSrali	3,85	892	680	2050	362
3. ocxanuri safere-sufris mSrali	4,8	992	815	3000	438
4. ojaleSi-bunebrivad n/t	3	944	656	1455	280
5. aladasturi- sufris mSrali	3,18	364	670	1950	307
6. Cxaveri- vardisferi	2,56	936	155	1200	160
7. aleqsandrouli-bunebrivad n/t	2,6	807	590	1235	250
8. mujureTuli bunebrivad n/t	2,9	972	660	1365	310

cxrili 2.7.2.

fenolmJavebisa da fenolaldehidebis Semcveloba wiTeli da vardisferi sxvadasxva tipis RvinomasalebSi

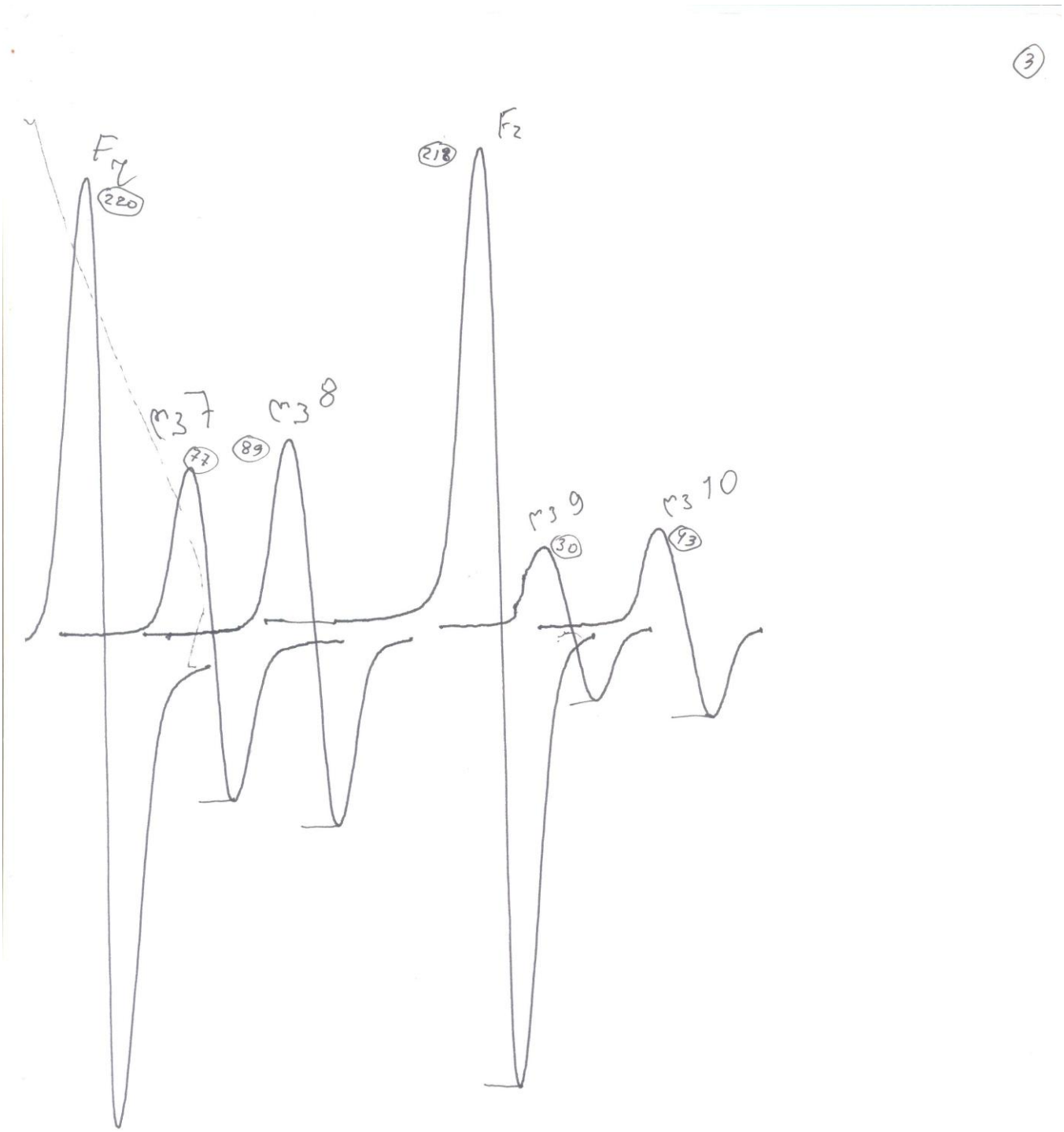
N	Rvinomasala	galis mJava	protokatexis mJava	protokatexis aldehidi	yavis mJava	p-kumaris mJava	ferulis mJava	vanilinis mJava	iasamnis mJava	salicilis mJava	vanilini	iasamnis aldehidi
1	saferavi sufris mSrali	+	+	+	+	+	+	+	+	+	+	+
2	kaberne-sovinioni sufris mSrali	+	+	+	+	+	+	+	+	+	+	+
3	ocxanuri safere sufris mSrali	+	+	+	+	+	+	+	+	+	+	+
4	ojaleSi bun.n/tkb.	+	+	kvali	+	+	+	+	+	+	+	+
5	aladasturi sufris mSrali	+	+	kvali	+	+	+	+	+	kvali	kvali	+
6	Cxaveri bun.vard.sufris mSrali	+	+	kvali	+	+	kvali	+	+	+	kvali	+
7	aleqsandrouli bunebr. n/tkbili	+	+	+	+	+	+	kvali	+	kvali	kvali	kvali
8	mujureTuli	+	+	+	+	+	+	+	+	kvali	kvali	kvali

alkoholuri duRilis procesSi fenoluri nivTierebebis dagrovebis dinamikaze dakvirvebam gviCvena, rom masze gavlenas axdens durdosTan kontaqtis xangrZlivoba. rac ufro xangrZlivia moduRari tkbilis durdosTan kontaqtis dro, miT ufro meti fenoluri nivTierebebi fiqsirdeba RvinomasalaSi. es kanonzomiereba kargad Cans winandlis saferavis durdoze ori, oTxi, eqvsi da rva dReRamis ganmavlobaSi duRilisas, fenoluri naerTebis Semcvelobis cvlilebiT. fenoluri naerTebis Semcvelobis mixedviT, kanonzomierad icvleba am Rvinomasalebis antioqsidanturi aqtivobac.

saeqsperimento Rvinomasalebis antioqsidanturi aqtivoba ganvsazRvreT epmr-meTodiT, anu fremis radikalebis sawyisi da Rvinis mier STanTqmis Semdeg darCenili radikalebis sxvaobiT gamoviTvaleT TiToeuli saeqsperimento Rvinis antioqsidantoba. nax. 2.7.1

yvelaze maRali antioqsidantoba aRmoaCnda saferavisa da ocxanuri saferesgan damzadebul Rvinoebs, yvelaze mcire – Cxaverisa da aladasturis jiSebisagan damzadebul Rvinoebs. Nnafareulis saferavis Rvinis antioqsidanturi aqtivoba aRmoCnda yvelaze maRali – 86,2%, xolo Cxaveris Rvinos – mcire – 15 %.

Sedegebi naCvenebia cxrili 2.7.3-Si



nax. 2.7.1Ynafareulis saferavis sufris mSrali Rvinis (#9), ocxanuri saferes sufris mSrali Rvinis (#10), axaSnis sufris n/tkbili Rvinis (#7), kaberne-sovinionis sufris mSrali Rvinis (#8) da fremis radikalebis (Fr) epmr-speqtrebi.

cxrili 2.7.3

wiTeli Rvinomasalebis fenoluri nivTierebebi da antioqsidanturi aqtivoba

Rvinomasalebi	jiSis gavrcelebis adgili	saerTo fenolebi,g/l	antioqsidanturi aqtivoba, %
saferavi - sufris mSrali	kardenaxi	3.14	50.5
saferavi-bunebrivad naxevradtkbili	qinZmarauli	4.1	69.6
saferavi - sufris mSrali (1)	winandali	3.1	46.7
saferavi - sufris mSrali (2)	winandali	3.8	54.3
saferavi - sufris mSrali (3)	winandali	4,0	69
saferavi - sufris mSrali (4)	winandali	4.3	71.3
saferavi-bunebrivad naxevradtkbili	axaSeni	4.6	75
kaberne - sufris mSrali	winandali	3.8	59.6
saferavi - sufris mSrali	nafareuli	4.9	86.2
ocxanuri safere - sufris mSrali	zestafoni	4.8	80.3
aladasturi - sufris mSrali	ozurgeTi	3.18	51
ojaleSi - bunebrivad naxevradtkbili	martvili	3	39
mujureTuli - bunebrivad naxevradtkbili	ambrolauri	2.9	39
aleqsandrouli - bunebrivad naxevradtkbili	ambrolauri	2.6	23.7
Cxaveri - bunebrivad vardisferi, mSrali	ozurgeTi	2.56	15

SeniSvna: 1,2,3,4 – me-2,me-4,me-6 da me-8 dRes moxsnili saferavi WaWidan.

Catarebuli eqsperimentis Sedegad gamovlinda saqarTveloSi gavrcelebuli wiTelyurZniani vazis teqnikuri jiSebidan damzadebuli sxvadasxva tipis wiTeli Rvinoebis SedarebiTi antioqsidanturi aqtivoba. Ggamovlinda, aseve, Rvinis antioqsidanturi aqtivobis proporciuli damokidebuleba masSi fenoluri naerTebis koncentraciaze.

2.8. Sedegebis maTematikuri damuSaveba

Tu movaxdenT aRniSnuli eqsperimentuli kvlevis formalizebas anu mis maTematikur modelirebas, maSin SesaZlebloba mogvecema ganvazogadoT kvlevis Sedegebi yurZnis nebismieri jiSis Tu nebismieri regionis magaliTze. maTematikuri modelis saSualebiT advilad daproeqtdeba sainformacio monacemTa baza, romlis saSualebiTac, saWiro SemTxvevaSi, interaqtiul reJimSi moxdeba analitikuri amocanebis gadawyveta (vTqvaT, momxmareblis mier Rvinomasalebis avtomatizebuli SerCeva produqtis monacemebis sxvadasxva arCevanis mixedviT).

Semotanilia Semdegi aRniSvnebi:

$\mathbf{x_i}$ _ i=$\overline{1,n}$, Rvinomasalebi; $\mathbf{y_j}$ _ j=$\overline{1,m}$, Rvinomasalebis jiSebis gavrcelebis adgili;

$\mathbf{z_{ij}}$ _ i=$\overline{1,n}$, j=$\overline{1,m}$, i Rvinomasalis jiSis gavrcelebis j adgili;

$\mathbf{F^k_{ij}}$ _ i=$\overline{1,n}$, j=$\overline{1,m}$, k =0, 2, 4, 6, 8, i Rvinomasalis jiSis gavrcelebis j adgilidan miRebuli Rvinis fenoluri naerTebis Semcveloba g/l. duRilis dawyebidan k dReSi moxsnili WaWidan. k=0 SemTxvevisaTvis Rvinomasalis WaWaze duRilis dro ganusazRvrelia.

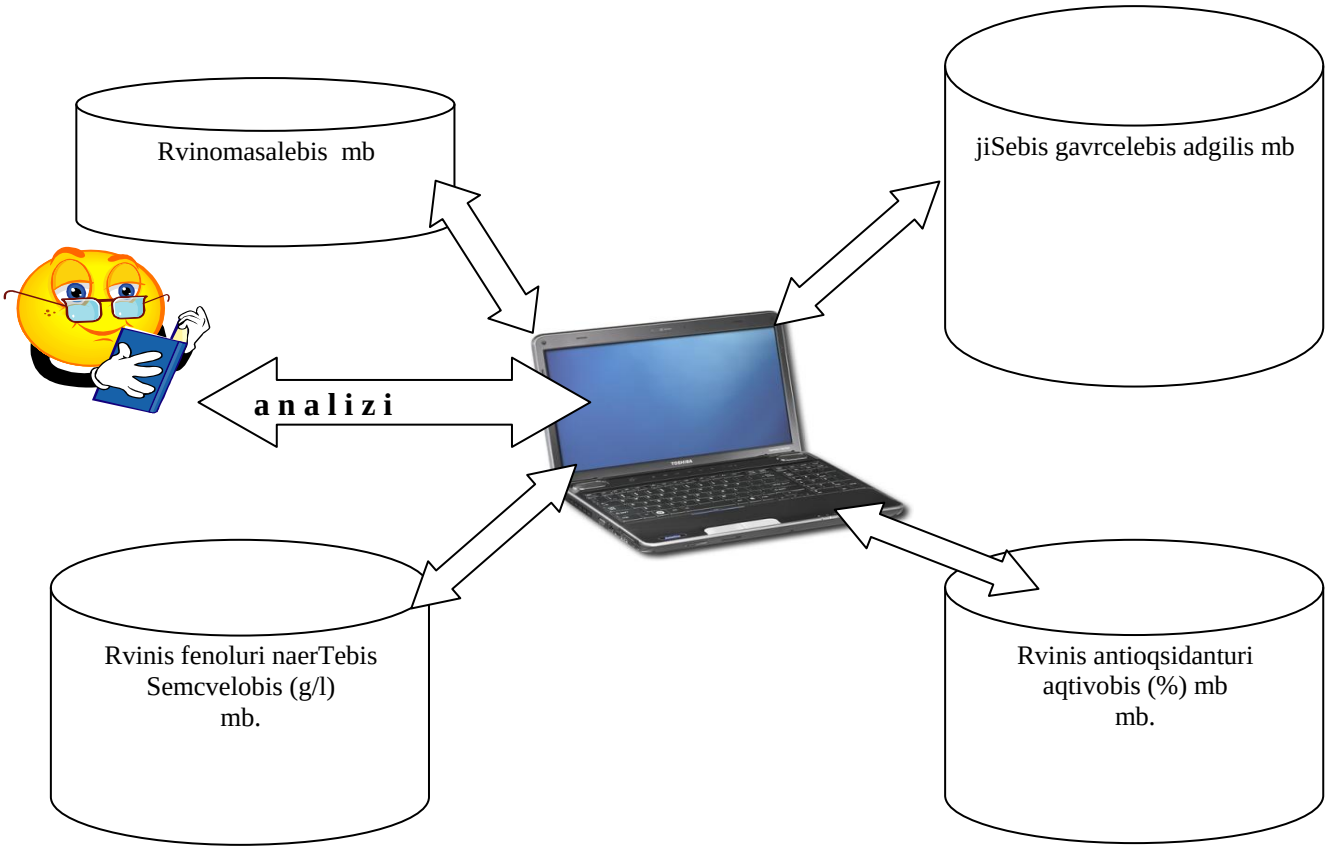
$\mathbf{h^k_{ij}}$ _ i=$\overline{1,n}$, j=$\overline{1,m}$, k = 0, 2, 4, 6, 8, i Rvinomasalis mier sareaqcio areSi radikalebis SeboWvis Semdeg darCenili fremis radikalebis raodenobis Sesabamisi epmr-speqtris simaRle duRilis dawyebidan k dReSi moxsnili WaWidan; k=0 SemTxvevisaTvis Rvinomasalis WaWaze duRilis dro ganusazRvrelia.

$\mathbf{A^k_{ij}}$ _ i=$\overline{1,n}$, j=$\overline{1,m}$, k = 0, 2, 4, 6, 8, i Rvinomasalis jiSis gavrcelebis j adgilidan miRebuli Rvinis antioqsidanturi aqtivoba (%) duRilis dawyebidan k dReSi moxsnili WaWidan. k= 0 SemTxvevisaTvis Rvinomasalis WaWaze duRilis dro ganusazRvrelia.

Aam aRniSvnebis saSualebiT Sedgenilia Rvinomasalis antioqsidanturi Rirebulebis ganmsazRvreli miznobrivi funqciis zogadi maTematikuri modeli:

$$F_{mizn.} = \begin{cases} \mathbf{F^k_{ij}} \Rightarrow \max, \ i=\overline{1,n},\ j=\overline{1,m},\ k = 0, 2, 4, 6, 8; \\ \mathbf{A^k_{ij}} \Rightarrow \max, \ i=\overline{1,n},\ j=\overline{1,m},\ k = 0, 2, 4, 6, 8; \\ \mathbf{h^k_{ij}} \Rightarrow \min, \ i=\overline{1,n},\ j=\overline{1,m},\ k = 0, 2, 4, 6, 8. \end{cases}$$

zemoTaRwerili aRniSvnebis safuZvelze davaproqteT sainformacio-saanalizo monacemTa baza, romelsac aqvs Semdegi saxe, nax.2.8.1:



2.9. alkoholuri sasmelis , pirobiTad,"zigu+"-is damzadebis teqnologiis SemuSaveba

„Rvinis kompania Sumi" flobs alkoholuri brendis „zigus" damzadebis teqnologias, romlis mixedviTac iwarmoeba da realizdeba sasmeli (produqciis sasaqonlo niSani damtkicebulia saqpatentis mowmobiT **MM 17783**). misi teqnologia iTvaliswinebs saferavis TviTnadeni tkbilis gamoyenebas, xolo yurZnis kani da wipwa, umdidresi Tavisi antioqsidanturi fenoluri nivTierebebiT, rCeba gamouyenebeli. aqedan gamomdinare, gamovikvlieT ra, saferavis kanis stilbenebi da sxva fenoluri nivTierebebi, miznad davisaxeT, aRniSnuli komponentebis da „zigus" zogierTi teqnologiuri parametris gamoyenebiT SegvemuSavebina axali teqnologia

gazrdili antioqsidanturi aqtivobis mqone produqtis misaRebad. teqnologia Semdegi saxiT Camoyalibda:

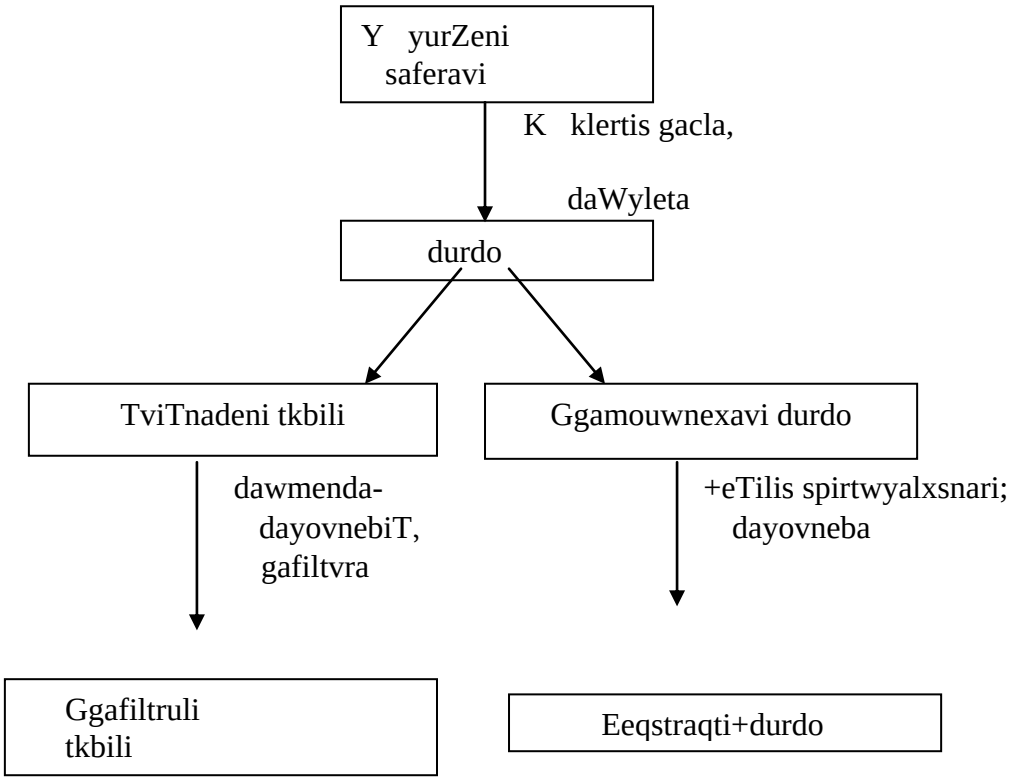
krefen saferavs teqnikuri simwifis periodSi, aclian klerts, daWyleten da gamoacalkeveben TviTnaden tkbils. Ddurdos aTavseben specialur WurWelSi, amateben eTilis spirtis wyalxsnars da ayovneben eqstraqciisaTvis, TviTnaden tkbils aTavseben siciveze TviTdawmendis mizniT, Semdeg leqidan moxsnian da civad filtraven azbest-celulozis filtr-wnexSi. Ggafiltrul tkbils moaTavseben specialur WurWelSi, umateben samwliani davargebis sabrende spirts im raodenobiT, rom nazavis spirtianoba Seadgendes 18_20 moc.%. durdos eqstraqciis damTavrebis Semdeg mas ganacalkeveben, eqstraqts gafiltraven civ pirobebSi azbest-celulozis filtr-wnexSi da miiReba saferavis eqstraqti daaxloebiT 20 moc.% alkoholis SemcvelobiT. Semdeg daspirtul tkbils Seureven saferavis eqstraqts 20 % raodenobiT, limonmJaviT Seasworeben titrul simJaves kondiciamde da ayovneben muxis kasrebSi aranakleb 2 Tvisa. Bbunebrivad dawmendil nazavs asxamen boTlebSi (sqema 2.9.1) alkoholuri sasmelis fizikur-qimiuri maCveneblebi warmodgenilia cxrilSi 2.9.1

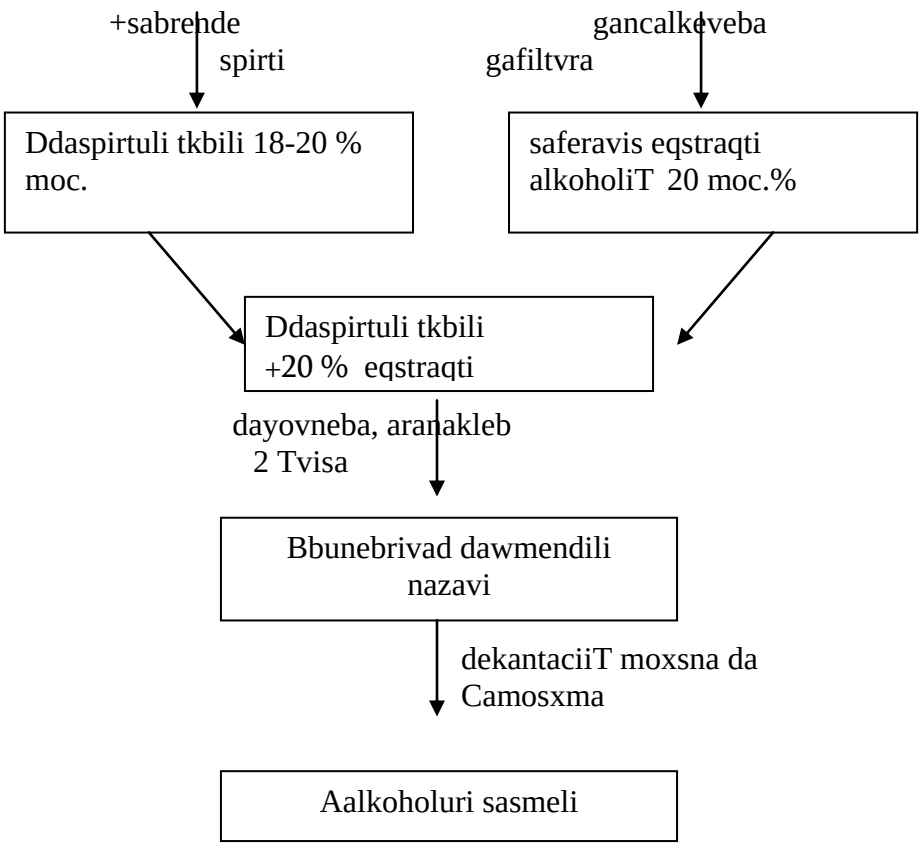
cxrili 2.9.1.

alkoholur sasmel "zigu+"-is fizikur-qimiuri maCveneblebi

maCveneblis dasaxeleba	**norma**
garegani saxe	**gamWvirvale siTxe**
feri	**muqi lalisferi**
gemo da aromati	**harmoniuli, nazi, sasiamovno.**
alkoholi, moc %	**18-20**
titruli mJavianoba, g/l	**4-5**
Saqris masuri wili,%	**16-18**

eqstraqti,g/l, aranakleb	**165**
saerTo fenoluri naerTebi, g/l,	**2,5-3,0**
saerTo saRebavebi, mg/l	**350-500**
trans-rezveratrolis raodenoba, mg/l	**2,5-3,0**
ε–viniferinis raodenoba,mg/l,	**0,5-1,0**
antioqsidanturi aqtivoba, %(epmr)	**50**





sqema 2.9.1. alkoholur sasmel “zigu+”-is damzadebis teqnologiuri sqema

rac Seexeba gansxvavebas arsebuli da axali teqnologiiT damzadebuli sasmelebis maxasiaTeblebs Soris, igi asaxulia cxrili 2.9.2 saxiT.

cxrili 2.9.2.

alkoholur sasmelebis "zigu" da "zigu+"-is fizikur-qimiuri maCveneblebi

maCveneblis dasaxeleba	**"zigu"**	**"zigu +"**
garegani saxe	**gamWvirvale siTxe**	**gamWvirvale siTxe**
feri	**Mmuqi lalisferi**	**Mmuqi lalisferi**
gemo da aromati	**harmoniuli**	**harmoniuli, nazi, sasiamovno**

alkoholi, moc %	**19,5**	**19,6**
titruli mJavianoba, g/l	**4.5**	**4,5**
Saqris masuri wili,%	**16.5**	**16.8**
eqstraqti,g/l,	**165**	**177**
saerTo fenoluri naerTebi, g/l,	**2,5**	**2.8**
saerTo saRebavebi, mg/l,	**320**	**400**
trans-rezveratrolis raodenoba,mg/l,	**-**	**2.8**
ε–viniferinis raodenoba, mg/l aranakleb	**–**	**0.96**
antioqsidanturi aqtivoba, %(epmr),	**29**	**52**

monacemebi naTlad miuTiTebs alkoholuri sasmelis “zigu+”-is upiratesobas antioqsidanturi aqtivobis TvalsazrisiT, rac misi 29 %-dan 52 %-mde gazrdaSi gamoixateba.

2.10 mosalodneli ekonomikuri efeqtis angariSi

TviTRirebuleba:

1 l alkoholuri sasmeli “zigu+”-isTvis (kondiciebi: alkoholi - 18-20 %; Saqari – 16-18 %) 1 kg saferavis yurZnis fasi Seadgens 0,52 lars.

gamosavlianoba 1 kg yurZnidan – 630 ml;

1 l “zigu+”is dasamzadeblad saWiro, minimum, samwliani daZvelebis 63-65 %-iani sabrende spirti - 0,244 l; fasi (1 l – 10,59 lari) 2,58lari;

1 l “zigu+”-is dasamzadeblad saWiro 50 %-iani spirti – 0,087 l. (1 l 95 %-iani eTilis spirtis fasi 11.7 lari) fasi – 0,54lari;

1 l sasmelze gaTvaliswinebuli sawarmoo da sxva danaxarjebi – 0,20 lari.

e.i. 1 l “zigu+”-is **TviTRirebuleba** 0,52 + 2.58 + 0,54 + 0, 20 = 3,84 (lari)

rentabeloba – 200 %

e.i. rentabeloba – 3,84 X 2= 7.68

d.R.g – 18 % - 7.68 X 0,18 = 1.38 (lari)

sarealizacio fasi – 3,84 + 7.68 = 11.52 lari

mogeba 1 l Camosasxmel sasmelze - 11.52 - 3.84 – 1.38 = 6.3 lari

d a s k v n e b i

- saqarTveloSi gavrcelebuli vazis feradyurZniani jiSebis (saferavi, kaberne-sovinioni, ocxanuri safere, ojaleSi, aladasturi, Cxaveri, aleqsandrouli, mujureTuli, asureTuli Savi**)** yurZnis kanebSi ε-.viniferinis koncentracia dafiqsirda 0,26_0,98 mg/100g intervalSi; saferavis gavrcelebis adgilis da ε-.viniferinis Semcvelobis mixedviT gamovlinda Tanmimdevroba **winandali > kardenaxi > axaSeni > qinZmarauli, 0,98–0,48 მგ/100გ;** yvela jiSis SemTxvevaSi gamoikveTa saerTo kanonzomiereba _ trans_rezveratrolis raodenoba aRemateba ε-.viniferinis raodenobas;

- sufris mSrali da bunebrivad naxevradtkbili wiTeli Rvinomasalebis erTwliani formirebis periodSi ε-.viniferinis koncentracia mcirdeba. Ees Semcireba ganpirobebulia ε-.viniferinis dimerizaciiT da Sedegad warmoiqmneba tetrameruli stilbeni; pasterizacia axdens dimerizaciis intensifikacias;

- saeqsperimento da komerciul sufris mSral da bunebrivad naxevradtkbil RvinoebSi erTdroulad arsebobs trans-rezveratroli da misi warmoebulebi: dimeri ε-.viniferini da tetrameruli stilbeni. maT Soris dominantia trans-rezveratroli; Rvinomasalebis teqnologiuri damuSavebis gavlena stilbenebze komerciul RvinoebSi gamoixateba maTi Semcirebuli raodenobebiT saeqsperimento RvinoebTan SedarebiT;

- trans-rezveratrolis da ε-.viniferinis gazrdili koncentracia garkveul gavlenas axdens vaSl-rZemJava duRilze, amitom, wiTeli Rvinoebis individualuri stilbenebiT gamdidrebis saWiroebis SemTxvevaSi, maTi damateba mizanSewonilia vaSl-rZemJavuri duRilis Catarebis Semdeg.

- @mizanSewonili da rekomendirebulia, samkurnalo-profilaqtikuri daniSnulebiT gamiznuli wiTeli Rvinoebi damzaddes postfermentuli maceraciis meTodis gamoyenebiT, romelic Rvinis antioqsidanturi nivTierebebiT gamdidrebis saSualebas iZleva

- qarTuli wiTeli Rvinoebis antioqsidanturi aqtivoba proporciulia maTi fenoluri nivTierebebis koncentraciisa da meryeobs 15_86% intervalSi (**epmr** meTodiT);

- daproeqtebulia antioqsidanturi aqtivobis mixedviT qarTuli wiTeli Rvinoebis SerCevis maTematikuri modeli;

- saferavis biologiurad aqtiuri fenoluri nivTierebebis da, maT Soris, stilbenebis samkurnalo-profilaqtikuri mizniT gamoyenebisaTvis SemuSavebulia maRali antioqsidanturi Tvisebebis matarebeli alkoholuri sasmelis, pirobiTad, “zigu+”_is teqnologia

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