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CHENOPODIUM ALBUM (SHO'RA) VA AMARANTHUS RETROFLEXUS (QAYRILGAN MACHIN)O'SIMLIKLARINING BARGI ASOSIDA HAR XIL NISBATLARDA OLINGAN SPIRTLI VA SUVLI EKSTRAKTLARNI ANTIRADIKALLIK XUSUSIYATINI DPPH METODI BILAN BAHOLASH

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Annotatsiya Ushbu maqolada Chenopodium album (Sho'ra) va Amaranthus retroflexus (Qayrilgan machin) o'simliklarining barglaridan olingan spirtli va suvli ekstraktlarning antiradikallik xususiyatlari DPPH (2,2-difenil-1-pikrilgidrazil) radikal neytrallashuvi metodi yordamida baholandi. Erkin radikallar inson organizmida oksidlovchi stressga sabab bo'lib, hujayra shikastlanishlari, yallig'lanish jarayonlari va turli kasalliklarning rivojlanishida muhim omil hisoblanadi. Shu bois tabiiy antioksidantlarga bo'lgan qiziqish ortib bormoqda. Tadqiqotda barglardan spirtli va suvli ekstraktlar turli nisbatlarda tayyorlandi va ularning DPPH radikallarini neytrallashtirish samaradorligi spektrofotometr yordamida o'lchandi. Natijalar shuni ko'rsatdiki, suvli ekstraktlar spirtli ekstraktlarga qaraganda yuqori antiradikal faollikka ega bo'lib, bu ularning tarkibida ko'proq gidrofil (suvda eruvchi) antioksidant moddalar mavjudligini ko'rsatadi. Amaranthus retroflexus ekstrakti Chenopodium album ekstraktlariga nisbatan biroz ustunlik ko'rsatdi, ammo ikkala o'simlik ham sezilarli darajada radikallarni neytrallashtirish qobiliyatini namoyish etdi. Ushbu o'simliklarning tabiiy antioksidant xususiyatlari ularni farmatsevtika va oziq-ovqat sanoatida foydali qo'shimcha sifatida qo'llash imkonini beradi. Shuningdek, ularning salomatlikni qo'llab-quvvatlashda, hujayra darajasida oksidlovchi stressni kamaytirishda va yallig'lanish jarayonlarini bostirishda potentsial manba ekanligi ta'kidlandi. Mazkur tadqiqot tabiiy vositalar yordamida radikal neytrallashuvni oshirish va oksidlovchi stressga qarshi kurashishda Chenopodium album va Amaranthus retroflexus ekstraktlarining ahamiyatini yana bir bor tasdiqlaydi. Ushbu natijalar kelgusida yanada kengroq farmatsevtik va biologik tadqiqotlar olib borilishi uchun asos yaratadi.

Kalit so'zlar: Chenopodium album, Amaranthus retroflexus, antiradikallik, DPPHmetodi, spirtli ekstrakt, suvli ekstrakt, antioksidant, erkin radikallar, oksidlovchi stress.

Havola uchun

Imomova, M. Y., & Gafurova, M. A. CHENOPODIUM ALBUM (SHO'RA) VA AMARANTHUS RETROFLEXUS (QAYRILGAN MACHIN)O'SIMLIKLARINING BARGI ASOSIDA HAR XIL NISBATLARDA OLINGAN SPIRTLI VA SUVLI EKSTRAKTLARNI ANTIRADIKALLIK XUSUSIYATINI DPPH METODI BILAN BAHOLASH. *Tovarlar Kimyosi Va Xalq Tabobati Jurnali*, *5*(5). https://doi.org/10.55475/jcgtm/vol5.iss5.2026.666

Kirish. Oxirgi yillarda tabiiy antioksidantlarga bo'lgan qiziqish oshmoqda, chunki ular inson organizmini erkin radikallardan himoya qilishda muhim ahamiyatga ega. Erkin radikallar hujayra darajasida oksidlovchi stress hosil qilib, turli kasalliklarning, jumladan, yurak-qon tomir kasalliklari, saraton va qarish jarayonlarining rivojlanishiga sabab bo'ladi. Shu sababdan, o'simliklardan olinadigan tabiiy antioksidantlar tadqiqoti dolzarb hisoblanadi [1].

Chenopodium album (Sho'ra) va Amaranthus retroflexus (Qayrilgan machin) bir yillik o'simliklar bo'lib, an'anaviy tibbiyotda turli maqsadlarda qo'llaniladi. Ushbu o'simliklarning barglaridan olinadigan ekstraktlarning antiradikallik xususiyatlarini baholash maqsadida DPPH (2,2-difenil-1-pikrilgidrazil) metodi tanlandi [2]. Chenopodium album va Amaranthus retroflexus o'simliklari bahor yoki yoz oylarida yig'ilib, barglari quritildi va maydalanib tayyorlandi. Barglar asosida turli nisbatlarda (masalan, spirtli va suvli) ekstraktlar tayyorlandi. Spirtli ekstraktlar uchun etanol yoki metanol ishlatildi, suvli ekstraktlar esa oddiy distillangan suv yordamida tayyorlandi. DPPH metodiga ko'ra, tayyorlangan ekstraktlar ma'lum miqdorda DPPH eritmasiga qo'shildi. Aralashma qora-binafsha rangdan rangsiz yoki och binafsha rangga aylangunicha 30 daqiqa davomida qorong'ida ushlab turildi. Rang o'zgarishi spektrofotometr yordamida 517 nm to'lqin uzunligida o'lchandi [3].

DPPH (2,2-difenil-1-pikrilgidrazil) metodi o'simliklardan olingan ekstraktlarning antioksidant xususiyatlarini o'rganishda eng ko'p ishlatiladigan usullardan biridir. Ushbu usulda, DPPH molekulasi — stabillashgan erkin radikal bo'lib, u tarkibida binafsha rang saqlaydi. Antioksidant moddalar ushbu radikallar bilan reaksiyaga kirishganda, radikal neytrallashib, eritmadagi rang o'zgaradi, bu esa spektrofotometr orqali o'lchanadi. DPPH molekulasi o'zining kuchli erkin radikal xususiyati tufayli binafsha rangga ega bo'ladi. O'simlik ekstraktidagi antioksidant moddalar bilan o'zaro ta'sirda, DPPH radikali elektron yoki vodrogen atomini qabul qilib, rangsiz yoki sarg'ish tusga aylanadi. Bu jarayonning darajasi absorbansning (nurlanish so'rilishi) kamayishi orqali aniqlanadi. Ushbu o'zgarish 517 nm to'lqin uzunligida o'lchanadi va antioksidant faollik sifatida baholanadi [4,5]. Tadqiqotda Sho'ra va Ko'k amarant o'simliklarining antioksidant salohiyati DPPH radikalini tutish metodi orqali o'rganildi. Ushbu usulning afzalliklari orasida uning oddiyligi, tezkorligi va yuqori sezgirligi borligi ta'kidlandi. DPPH testidan foydalanib, ekstraktlarning antiradikallik faolligi IC_{50} ko'rsatkichlari yordamida aniqlandi va solishtirildi [6].

Tajriba qism. DPPH usuli yordamida antiradikal faollikni aniqlash

O'simlik ekstraktlarining antiradikal faolligi DPPH (2,2-difenil-1-pikrilgidrazil) usuli yordamida spektrofotometrik aniqlanib, Blois metodikasi asosida ayrim o'zgartirishlar bilan amalga oshirildi. 7,92 mM konsentratsiyali DPPH eritmasi etanolda tayyorlanib, yorug'likdan himoyalangan holda xona haroratida 30 daqiqa saqlandi. **Chenopodium album** (sho'ra) va **Amaranthus retroflexus** (qayrilgan machin) barglaridan 1:1, 3:1 va 1:3 nisbatlarda spirtli hamda suvli ekstraktlar tayyorlandi. Buning uchun 1 g o'simlik namunasi 25 ml 96 % etanolda 20 daqiqa ultratovushli vannada ekstraksiya qilinib, 0,45 mkm filtrdan o'tkazildi.

Antiradikal faollikni aniqlashda 3 ml DPPH eritmasiga 25, 50, 75 va 100 mkl ekstrakt qo'shilib, umumiy hajm etanol bilan 3,1 ml ga yetkazildi. Nazorat va tajriba namunalarining optik zichligi 517 nm to'lqin uzunligida **YOKE K7000** spektrofotometrida 30 daqiqa davomida har 5 daqiqada o'lchandi. Antiradikal faollik quyidagi formula bo'yicha hisoblandi:

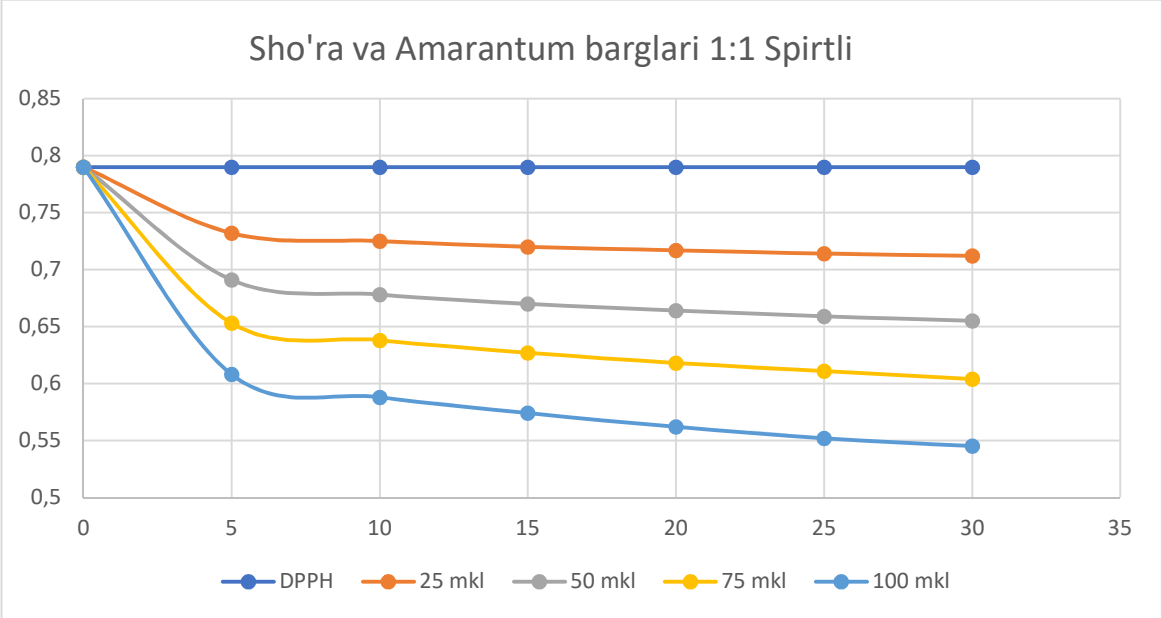
$$ARF\% = \frac{D_1 - D_2}{D_1} \cdot 100\%$$

Olingan natijalar:

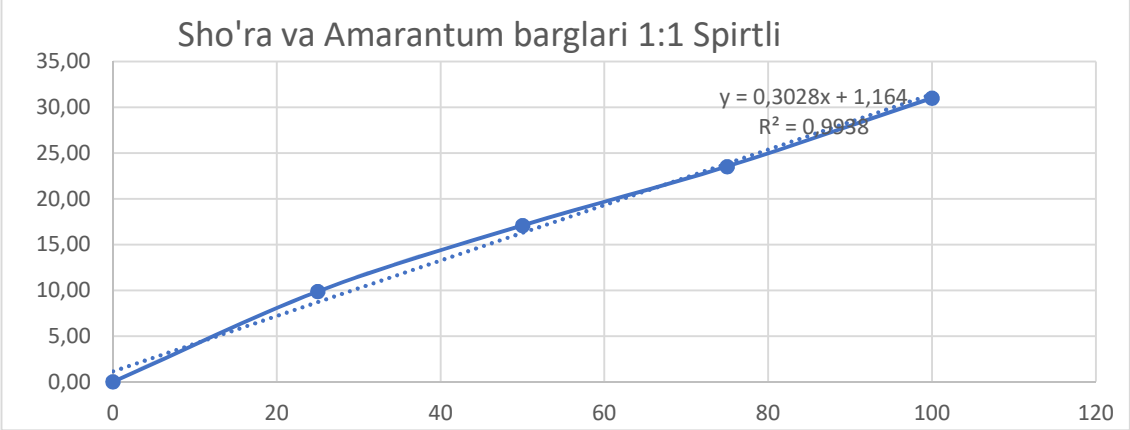
1-jadval. ***Chenopodium album* (Sho'ra)** hamda ***Amaranthus retroflexus (Qayrilgan machin)*** o'simliklarining bargi asosida 1:1 spirtli ekstraksiyasining antiradikallik faollik qiymatlari.

Hajm, mkl	Vaqt, daq.	namuna					
		Abs, D	ARF%		Vaqt, daq.	Abs, D	ARF%
25	0	0,79	0,00	75	0	0,79	0,00
	5	0,732	7,34		5	0,653	17,34
	10	0,725	8,23		10	0,638	19,24
	15	0,72	8,86		15	0,627	20,63
	20	0,717	9,24		20	0,618	21,77
	25	0,714	9,62		25	0,611	22,66
	30	0,712	**9,87**		**30**	0,604	**23,54**
50	0	0,79	0,00	100	0	0,79	0,00

	5	0,691	12,53		5	0,608	23,04
	10	0,678	14,18		10	0,588	25,57
	15	0,67	15,19		15	0,574	27,34
	20	0,664	15,95		20	0,562	28,86
	25	0,659	16,58		25	0,552	30,13
	30	0,655	**17,09**		**30**	0,545	**31,01**



1-rasm. Namunalar eritmalarining o'lchangan nur yutilishining grafikda ko'rinishi.



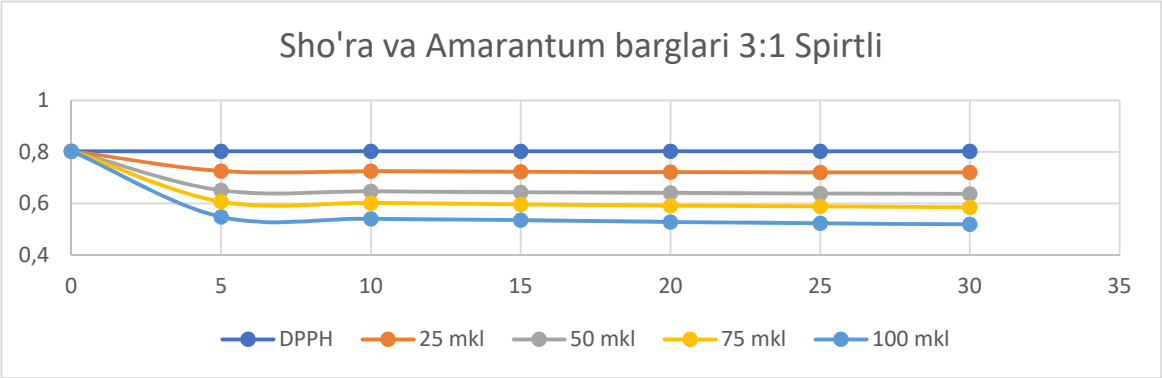
2-rasm. Spirtli estraksiya qilingan namunaning 30-daqiqada aniqlangan ARF%

$$IC_{50} = \frac{(50 - 1{,}164)}{0{,}3028} = 161{,}28\ mkl$$

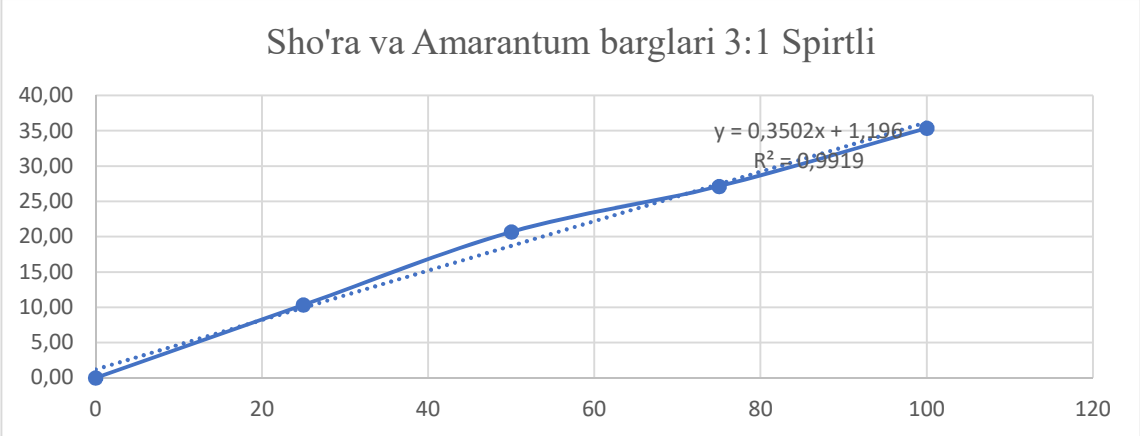
2-jadval. **Chenopodium album (Sho'ra)** hamda **Amaranthus retroflexus (Qayrilgan machin)** o'simliklarining bargi asosida 3:1 spirtli ektraksiya antiradikallik faollik qiymatlari.

Hajm, mkl	Vaqt, daq.	namuna					
		Abs, D	ARF%		Vaqt, daq.	Abs, D	ARF%
25	0	0,803	0,00	75	0	0,803	0,00
	5	0,726	9,59		5	0,607	24,41
	10	0,725	9,71		10	0,602	25,03
	15	0,723	9,96		15	0,597	25,65

	20	0,722	10,09		20	0,592	26,28
	25	0,721	10,21		25	0,589	26,65
	30	0,72	**10,34**		**30**	0,585	**27,15**
50	0	0,803	0,00	100	0	0,803	0,00
	5	0,651	18,93		5	0,548	31,76
	10	0,647	19,43		10	0,541	32,63
	15	0,644	19,80		15	0,535	33,37
	20	0,641	20,17		20	0,528	34,25
	25	0,639	20,42		25	0,523	34,87
	30	0,637	**20,67**		**30**	0,519	**35,37**



3-rasm. DPPH eritmasiga qo'shilgan bo'sh va tekshirilgan spirtli esktraksiya qilingan namunalar eritmalarining o'lchangan nur yutilishining grafikda ko'rinishi.



4-rasm. Spirtli estraksiya qilingan namunaning 30-daqiqada aniqlangan ARF%

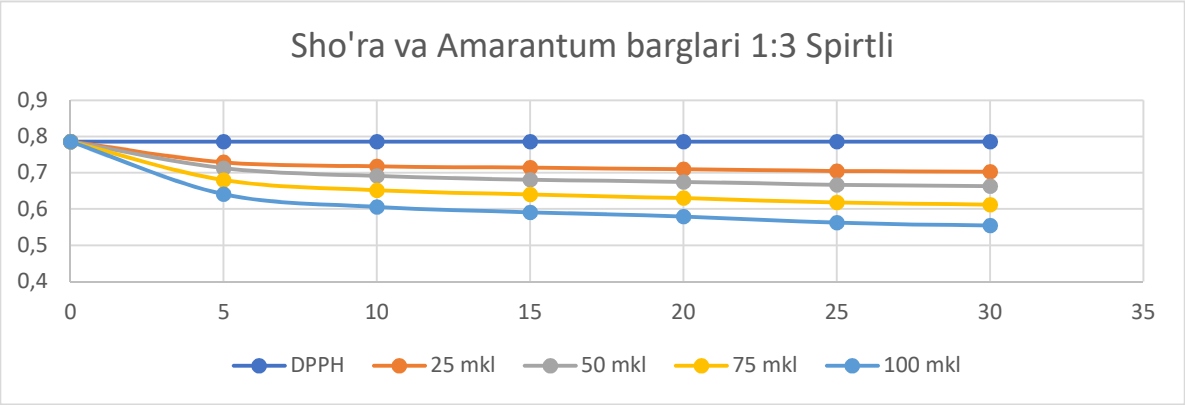
$$IC_{50} = \frac{(50 - 1.196)}{0{,}3502} = 139{,}36\ mkl$$

3-jadval.

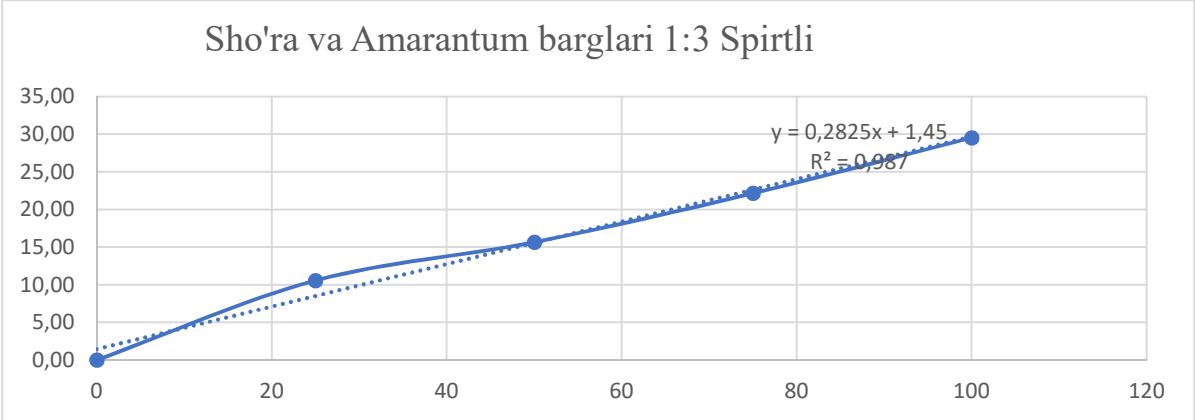
Chenopodium album* (Sho'ra)** hamda ***Amaranthus retroflexus (Qayrilgan machin) o'simliklarining bargi asosida 1:3 spirtli ektraksiya antiradikallik faollik qiymatlari.

Hajm, mkl	Vaqt, daq.	namuna					
		Abs, D	ARF%		Vaqt, daq.	Abs, D	ARF%
25	0	0,786	0,00	75	0	0,786	0,00
	5	0,729	7,25		5	0,68	13,49
	10	0,718	8,65		10	0,652	17,05
	15	0,714	9,16		15	0,64	18,58

	20	0,71	9,67		20	0,63	19,85
	25	0,705	10,31		25	0,618	21,37
	30	0,703	**10,56**		**30**	0,612	**22,14**
50	0	0,786	0,00	100	0	0,786	0,00
	5	0,713	9,29		5	0,641	18,45
	10	0,691	12,09		10	0,606	22,90
	15	0,681	13,36		15	0,591	24,81
	20	0,675	14,12		20	0,579	26,34
	25	0,667	15,14		25	0,562	28,50
	30	0,663	**15,65**		**30**	0,554	**29,52**



5-rasm. DPPH eritmasiga qo'shilgan bo'sh va tekshirilgan spirtli esktraksiya qilingan namunalar eritmalarining o'lchangan nur yutilishining grafikda ko'rinishi.



6-rasm. Spirtli estraksiya qilingan namunaning 30-daqiqada aniqlangan ARF% lari

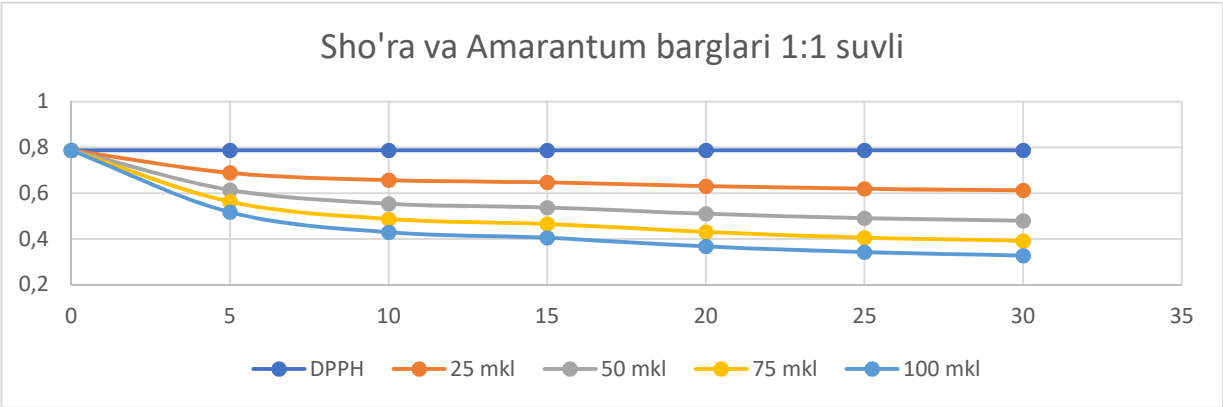
$$IC_{50} = \frac{(50 - 1.45)}{0{,}2825} = 171{,}86\ mkl$$

4-jadval.

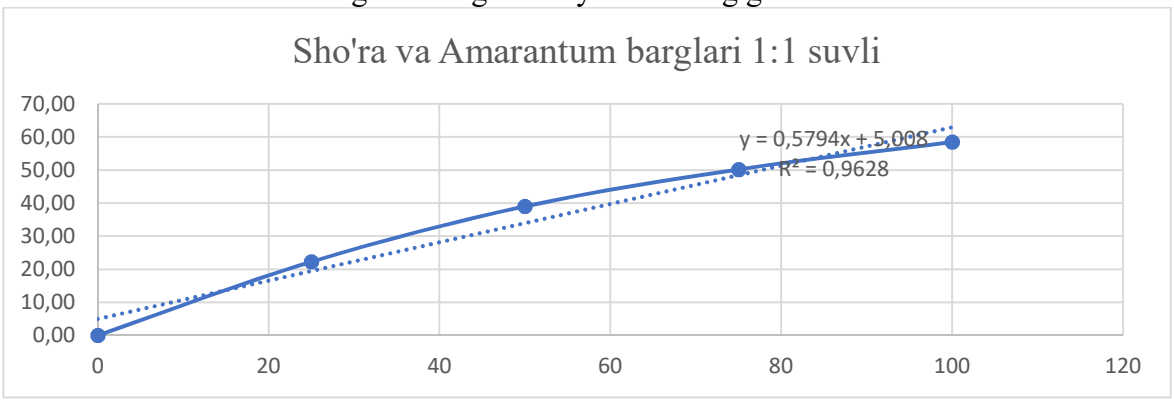
Chenopodium album* (Sho'ra)** hamda ***Amaranthus retroflexus (Qayrilgan machin) o'simliklarining bargi asosida 1:1 suvli ektraksiya antiradikallik faollik qiymatlari.

Hajm, mkl	Vaqt, daq.	namuna					
		Abs, D	ARF%		Vaqt, daq.	Abs, D	ARF%
25	0	0,787	0,00	75	0	0,787	0,00
	5	0,689	12,45		5	0,563	28,46
	10	0,657	16,52		10	0,487	38,12

	15	0,647	17,79		15	0,465	40,91
	20	0,631	19,82		20	0,431	45,24
	25	0,619	21,35		25	0,405	48,54
	30	0,612	22,24		**30**	0,392	50,19
50	0	0,787	0,00	100	0	0,787	0,00
	5	0,614	21,98		5	0,517	34,31
	10	0,554	29,61		10	0,429	45,49
	15	0,537	31,77		15	0,405	48,54
	20	0,51	35,20		20	0,367	53,37
	25	0,491	37,61		25	0,342	56,54
	30	0,48	39,01		**30**	0,327	58,45



7-rasm. DPPH eritmasiga qo'shilgan bo'sh va tekshirilgan suvli esktraksiya qilingan namunalar eritmalarining o'lchangan nur yutilishining grafikda ko'rinishi.



8-rasm. suvli estraksiya qilingan namunaning 30-daqiqada aniqlangan ARF% lari

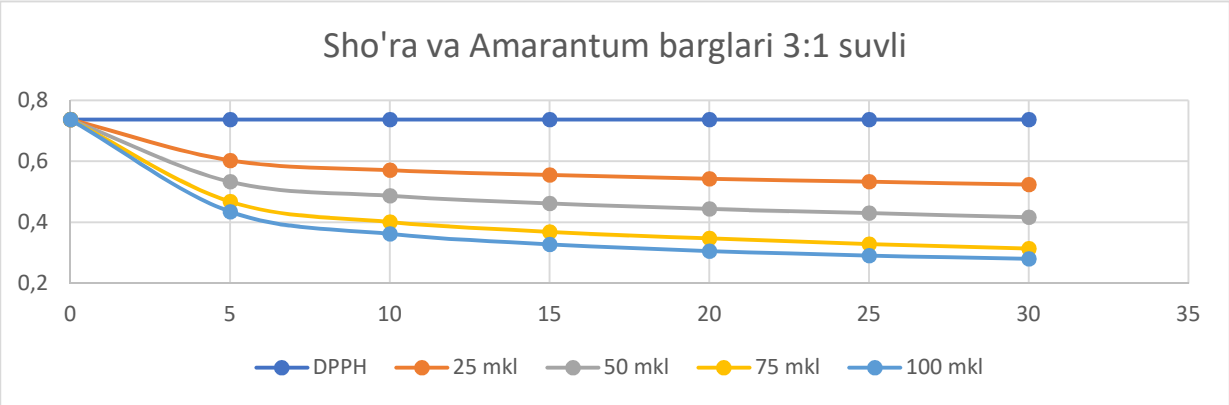
$$IC_{50} = \frac{(50 - 5.008)}{0{,}5794} = 77{,}653\ mkl$$

5-jadval.

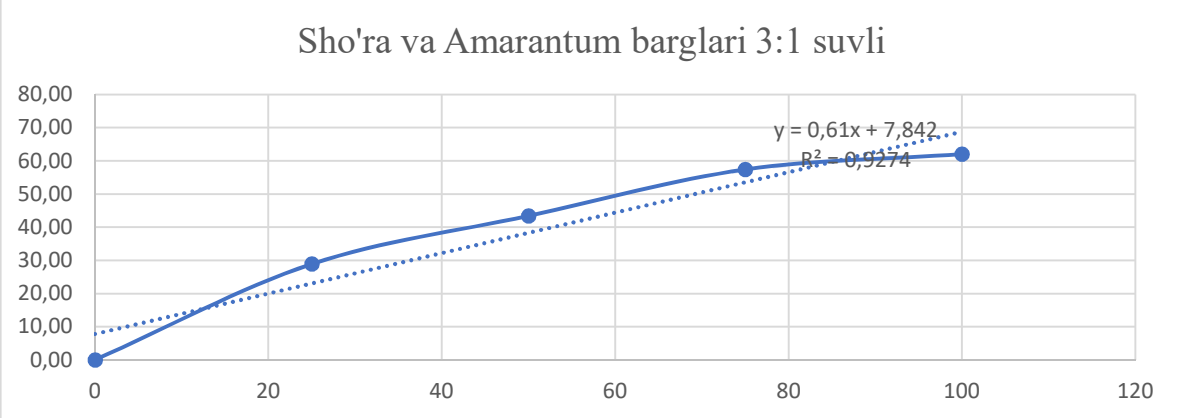
Chenopodium album* (Sho'ra)** hamda ***Amaranthus retroflexus (Qayrilgan machin) o'simliklarining bargi asosida 3:1suvli ektraksiya antiradikallik faollik qiymatlari.

Hajm, mkl	Vaqt, daq.	namuna					
		Abs, D	ARF%		Vaqt, daq.	Abs, D	ARF%
25	0	0,737	0,00	75	0	0,737	0,00
	5	0,603	18,18		5	0,468	36,50
	10	0,571	22,52		10	0,401	45,59
	15	0,555	24,69		15	0,369	49,93

	20	0,543	26,32		20	0,347	52,92
	25	0,533	27,68		25	0,329	55,36
	30	0,524	**28,90**		**30**	0,314	**57,39**
50	0	0,737	0,00	100	0	0,737	0,00
	5	0,533	27,68		5	0,435	40,98
	10	0,487	33,92		10	0,362	50,88
	15	0,462	37,31		15	0,328	55,50
	20	0,444	39,76		20	0,306	58,48
	25	0,43	41,66		25	0,291	60,52
	30	0,417	**43,42**		**30**	0,28	**62,01**



9-rasm. DPPH eritmasiga qo'shilgan bo'sh va tekshirilgan suvli esktraksiya qilingan namunalar eritmalarining o'lchangan nur yutilishining grafikda ko'rinishi.



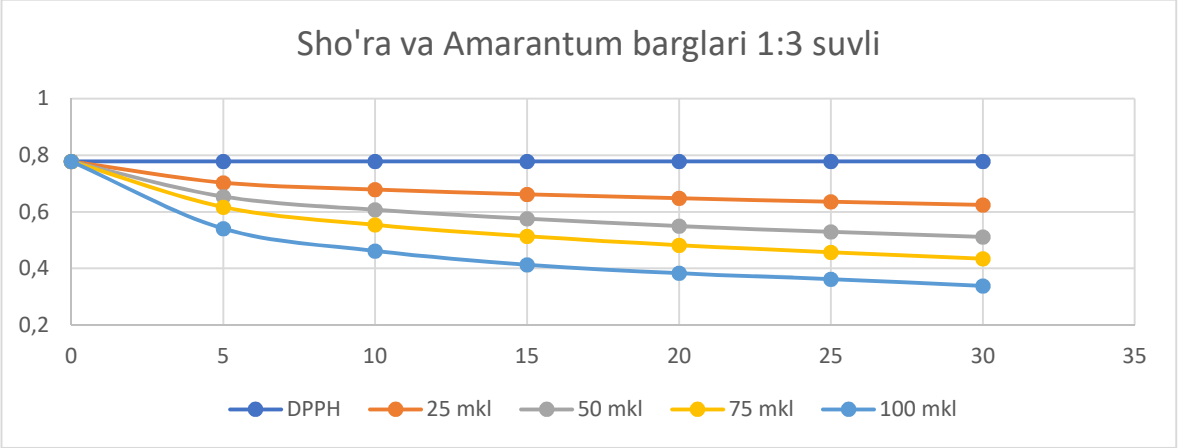
10-rasm. suvli estraksiya qilingan namunaning 30-daqiqada aniqlangan ARF% lari va hajmlari o'rastidagi bog'liqlik grafigi.

$$IC_{50} = \frac{(50 - 7{,}842)}{0{,}61} = 69{,}111\ mkl$$

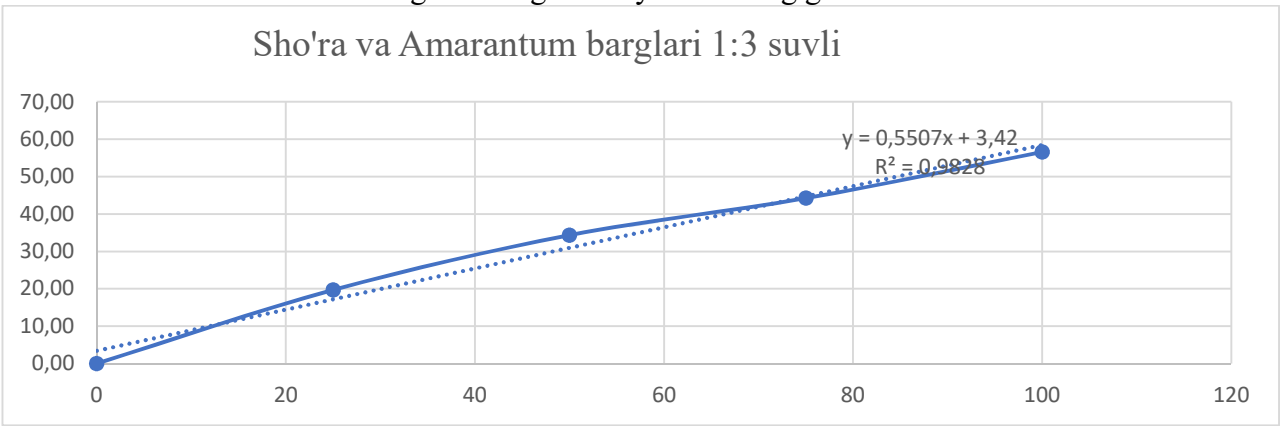
Chenopodium album* (Sho'ra)** hamda ***Amaranthus retroflexus (Qayrilgan machin) o'simliklarining bargi asosida 1:3 suvli ektraksiya antiradikallik faollik qiymatlari.

Hajm, mkl	Vaqt, daq.	namuna					
		Abs, D	ARF%		Vaqt, daq.	Abs, D	ARF%
25	0	0,778	0,00	75	0	0,778	0,00
	5	0,703	9,64		5	0,617	20,69
	10	0,679	12,72		10	0,554	28,79

	15	0,662	14,91		15	0,514	33,93
	20	0,648	16,71		20	0,482	38,05
	25	0,636	18,25		25	0,457	41,26
	30	0,625	**19,67**		**30**	0,434	**44,22**
50	0	0,778	0,00	100	0	0,778	0,00
	5	0,654	15,94		5	0,541	30,46
	10	0,607	21,98		10	0,462	40,62
	15	0,576	25,96		15	0,413	46,92
	20	0,55	29,31		20	0,383	50,77
	25	0,529	32,01		25	0,362	53,47
	30	0,511	**34,32**		**30**	0,338	**56,56**



11-rasm. DPPH eritmasiga qo'shilgan bo'sh va tekshirilgan suvli esktraksiya qilingan namunalar eritmalarining o'lchangan nur yutilishining grafikda ko'rinishi.



12-rasm. suvli estraksiya qilingan namunaning 30-daqiqada aniqlangan ARF% lari va hajmlari o'rastidagi bog'liqlik grafigi.

Grafikga o'tkazilgan trend chizig'i funksiya formulasi y=mx+b dan 50% ARF% namoyon qiluvchi hajmni (IC_{50}) x=(y-b)/m formulasi asosida hisoblandi:

$$IC_{50} = \frac{(50 - 3.42)}{0{,}5507} = 84{,}583\ mkl$$

7-jadval.Namunalar spirtli ekstraklarining100 mkldagi 30 daqiqadagi antiradikallik faolliklari qiymatlari (ARF%)

Vaqt	ARF%					
	Chenopodium album (Sho'ra) hamda *Amaranthus retroflexus (Qayrilgan machin) bargi 1:1 spirtli*	*Chenopodium album* (Sho'ra) hamda *Amaranthus retroflexus (Qayrilgan machin) bargi 3:1 spirtli*	*Chenopodium album* (Sho'ra) hamda *Amaranthus retroflexus (Qayrilgan machin) bargi 1:3 spirtli*	*Chenopodium album* (Sho'ra) hamda *Amaranthus retroflexus (Qayrilgan machin) bargi 1:1 suvli*	*Chenopodium album* (Sho'ra) hamda *Amaranthus retroflexus (Qayrilgan machin) bargi 3:1 suvli*	*Chenopodium album* (Sho'ra) hamda *Amaranthus retroflexus (Qayrilgan machin) bargi 1:3 suvli*
30-minut	31,01	35,37	29,52	58,45	62,01	56,56

8-jadval.Namunalarning IC_{50} – DPPH eritmasining 50 % gacha ingibirlash konsentratsiyasini (mkl)

Vaqt	ARF%					
	Chenopodium album (Sho'ra) hamda *Amaranthus retroflexus (Qayrilgan machin) bargi 1:1 spirtli*	*Chenopodium album* (Sho'ra) hamda *Amaranthus retroflexus (Qayrilgan machin) bargi 3:1 spirtli*	*Chenopodium album* (Sho'ra) hamda *Amaranthus retroflexus (Qayrilgan machin) bargi*	*Chenopodium album* (Sho'ra) hamda *Amaranthus retroflexus (Qayrilgan machin) bargi*	*Chenopodium album* (Sho'ra) hamda *Amaranthus retroflexus (Qayrilgan machin) bargi*	*Chenopodium album* (Sho'ra) hamda *Amaranthus retroflexus (Qayrilgan machin) bargi*
30-minut	161,28	139,36	171,86	77,653	69,111	84,583

Olingan natijalar muhokamasi. Eksperiment natijalari ko‘rsatdiki, Chenopodium album va Amaranthus retroflexus barglaridan olingan ekstraktlarning har biri DPPH radikallarini neytrallashtirishda sezilarli darajada faol edi. Suvli ekstraktlar spirtli ekstraktlarga nisbatan yuqori antiradikal faollik ko‘rsatdi, bu ularning tarkibida ko‘proq gidrofil (suvda eruvchi) antioksidant moddalar mavjudligini bildiradi. [11,12]. Amaranthus retroflexus аралашмали 3:1 нисбатдаги сувли экстракт 62,01% ни ташкил этиб, бошқа намуналарга нисбатан юқорироқ антиоксидантлик намоён қилди. Suvli ekstraktlarda esa farq kichikroq bo‘ldi, ammo ikkala o‘simlik ham o‘zining tabiiy antioksidant salohiyatini namoyish etdi [13,14].

Ushbu natijalar ko‘rsatadiki, Chenopodium album va Amaranthus retroflexus barglarining ekstraktlari tabiiy antioksidant sifatida ishlatilishi mumkin, bu esa ularni sog‘liqni mustahkamlash va kasalliklarning oldini olishda qo‘shimcha vosita sifatida qimmatli qiladi [15,16]. DPPH metodi yordamida o‘tkazilgan tadqiqot natijalari shuni ko‘rsatdiki, Chenopodium album (Sho’ra) va Amaranthus retroflexus (Qayrilgan machin) o‘simliklarining barglaridan olinadigan spirtli va suvli ekstraktlar sezilarli antiradikal faollikka ega. Suvli ekstraktlar yuqori samaradorlik ko‘rsatgan bo‘lsa, spirtli ekstraktlar ham ma’lum darajada foydali xususiyatlarni saqlab qoldi. Ushbu o‘simliklarning tabiiy antioksidant sifatida qo‘llanilishi salomatlikni qo‘llab-quvvatlashda va oksidlovchi stressni kamaytirishda muhim ahamiyatga ega [17,18].

Xulosa. Olib borilgan tadqiqot natijalari shuni ko‘rsatdiki, *Chenopodium album (Sho‘ra)* va *Amaranthus retroflexus (*Qayrilgan machin*)* o‘simliklarining barglari asosida tayyorlangan spirtli va suvli ekstraktlar yuqori darajada antiradikal faollik namoyon etdi. Ayniqsa, 3:1 nisbatda tayyorlangan spirtli ekstrakt 30 daqiqalik inkubatsiya davomida erkin radikallarni 35,37 % ga kamaytirish orqali kuchli faollik

ko‘rsatdi va uning IC_{50} qiymati 139,36 mkl ni tashkil etdi. Bu, ekstraktning kam miqdordayoq sezilarli radikal neytrallashuvga erishishini bildiradi. Suvli ekstraktlar orasida esa xuddi shu nisbatdagi namunalar 62,01 % antiradikal faollik bilan 69,111 mkl IC_{50} qiymatiga ega bo‘ldi. Bu esa *Chenopodium album* barglarining, ayniqsa suvli ekstraktining yuqori antioksidant salohiyatga ega ekanligini ko‘rsatmoqda. Ushbu natijalar shuni anglatadiki, *Chenopodium album* barglaridan tayyorlangan suvli ekstrakt inson salomatligini qo‘llab-quvvatlashda tabiiy antioksidant manbai sifatida istiqbolli hisoblanadi. Erkin radikallarning organizmda haddan tashqari ko‘pligi oksidlovchi stress deb nomlanadi. Bu holat esa DNK shikastlanishi, hujayra apoptozi (o‘z-o‘zini yo‘q qilish), yallig‘lanish jarayonlarining kuchayishi kabi xavfli jarayonlarga olib keladi. *Chenopodium album* ekstraktlarining yuqori antiradikal faolligi bu o‘simlikdan profilaktik va terapevtik maqsadlarda foydalanish imkoniyatini ochib beradi. Ayniqsa, sintetik antioksidantlar organizmda turli nojo‘ya ta’sirlar keltirib chiqarishi mumkinligini hisobga olsak, ekologik toza, tabiiy va arzon antioksidant manbai sifatida ushbu o‘simlikdan foydalanish dolzarb bo‘lib qolmoqda. Shuningdek, bu natijalar kelgusida farmatsevtika, biotibbiyot, parhez ozuqa sanoati va boshqa tarmoqlarda yangi mahsulotlar yaratishda *Chenopodium album* va *Amaranthus retroflexus* o‘simliklarining amaliy ahamiyatini ochib beradi. Keyingi bosqichlarda ushbu ekstraktlarning hujayra darajasidagi ta’siri, in vivo modellar (tirik organizmlarda) orqali tadqiq etilishi lozim.

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