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SELEKSIYA JARAYONIDA MARKERLARGA ASOSLANGAN SELEKSIYA USULIDAN FOYDALANISHNING AHAMIYATI

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Annotatsiya. *Paxta yetishtirish hajmi bo‘yicha O‘zbekiston 2022-2023 yil holatiga ko‘ra Xitoy, Hindiston, AQSH, Braziliya, Avstraliya, Turkiya, Pokistondan keyingi sakkizinchi o‘rinni egallaydi. Markerlarga asoslangan seleksiya usuli paxta yetishtiruvchi mamlakatlarda yangi va rivojlanayotgan, seleksiya muddatini qisqartirish va nav tozaligi yuqori bo‘lgan navlar yaratish imkonini beruvchi samarali usullardan biri hisoblanadi va bu borada Xitoy va AQSH yetakchilik qiladi. Bu ro‘yxatda O‘zbekiston Respublikasi Pokiston va Hindistondan keyingi beshinchi o‘rinni egallaydi. Ushbu maqolada seleksiya sohasida MAS usulini qo‘llashning ahamiyati va zarurati, ushbu sohada tadqiqotlar olib borgan olimlar va ularning tadqiqot natijalari qisqacha yoritib berilgan.*

Kalit so‘zlar: *Seleksiya, g‘o‘za, markerlaga asoslangan seleksiya, o‘rgimchakkana, bardoshlilik, tanlash.*

IMPORTANCE OF USING THE MARKER-BASED SELECTION METHOD IN THE SELECTION PROCESS

Abstract. *As of 2022-2023, Uzbekistan will take eighth place after China, India, USA, Brazil, Australia, Turkey, and Pakistan in terms of cotton production. The selection method based on markers is one of the new and developing methods in cotton-growing countries, which allows to reduce the selection period and create varieties with high purity, and China and the USA are the leaders in this regard. In this list, the Republic of Uzbekistan ranks fifth after Pakistan and India. In this article, the importance and necessity of using the MAS method in the field of breeding, the scientists who conducted research in this field and the results of their research are briefly explained.*

Key words: *Breeding, cotton, marker-based selection, spider mite, tolerance, selection.*

ВАЖНОСТЬ ИСПОЛЬЗОВАНИЯ МЕТОДА ОТБОРА НА ОСНОВЕ МАРКЕРОВ В ПРОЦЕССЕ ОТБОРА

Аннотация. *По итогам 2022-2023 годов по производству хлопка Узбекистан займет восьмое место после Китая, Индии, США, Бразилии, Австралии, Турции и Пакистана. Метод селекции на основе маркеров является одним из новых и развивающихся методов в странах-хлопководах, позволяющих сократить период селекции и создать сорта с высокой чистотой, а лидерами в этом отношении являются Китай и США. В этом списке Республика Узбекистан занимает пятое место после Пакистана и Индии. В данной статье кратко объяснены важность и необходимость использования метода МАС*

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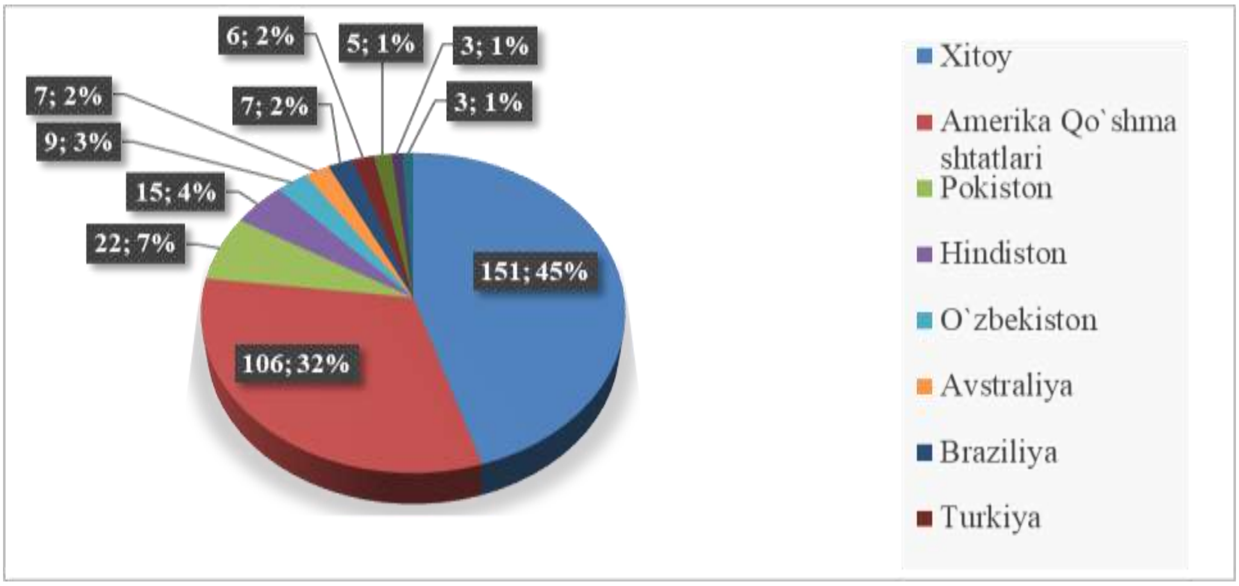
в области селекции, ученые, проводившие исследования в этой области, и результаты их исследований.

Ключевые слова: *Селекция, хлопок, маркерная селекция, паутинный клещ, толерантность, селекция.*

Kirish. Markerlarga asoslangan seleksiya (MAS) ekinlarning eng yaxshi navlarini yaratishning samarali usullaridan biridir [1]. MAS usulidan seleksiyada foydalanish orqali urug‘chilik samaradorligini ham keskin oshirish, nav tozaligini nazorat qilish mumkin [2]. Ko‘p o‘lchovli miqdoriy belgi lokusi-QTL (Quantitative Trait Locus) polimorfizmi tufayli markerlar yordamida tanlash samaradorligi keskin ko‘tarilgan [3; 4]. Paxtaning qimmatli-xo‘jalik belgilari bilan bog‘liq allellarning kashf etilishi bu allellarni to‘g‘ridan-to‘g‘ri MAS da qo‘llash imkonini bergan [4]. F_2 o‘simliklari 3 usul bilan, fenotip (1), kombinatsiyalangan marker-genotip va fenotip (MAS) (2), genotip (3) asosida tanlanadi [5]. MAS va bekkros chatishtirish bir nechta eng yaxshi ota-onalar qatoridan foydali QTL allellarining o‘ziga xos kombinatsiyalarini tanlash orqali nisbatan kam sonli genlarga ega bo‘lgan liniyalarning urug‘chilik qiymatini va nav tozaligini oshirishning samarali usuli bo‘la oladi [6; 7].

Bugungi kunda MAS usulidan dunyoning ko‘pgina mamlakatlari keng foydalanadi va bu usuldan seleksiya sohasida foydalanish bo‘yicha Xitoy va Amerika qo‘shma Shtatlari yetakchilik qiladi (1-rasm) [19]



1-rasm**.** Paxta yetishtirishda MAS bo‘yicha tadqiqot olib boruvchi top mamlakatlar.

So‘nggi yigirma yil davomida seleksiya va urug‘chilikda MAS usulidan foydalanish tez sur’atlar bilan o‘sdi. Bu usulni qo‘llash orqali bir qancha olimlar ko‘plab tadqiqotlar olib borishgan [8; 9; 10; 11; 12], Maheswari va boshqalar [13]. MAS usuli takroriy tanlov qilish va har qanday turdagi ekinlarda urug‘chiligini yaxshilash uchun muhim vosita ekanligini ta’kidlagan [2].

Nayakning tadqiqotlariga asoslanib, navlarni ko‘paytirishda eng samarali bo‘lgan marker yordamida seleksiya usuli morfologik xususiyatlarning nisbiy ahamiyatini hisobga olgan holda yoki hisobga olmagan holda, molekulyar markerlardan foydalanib urug‘chilik yo‘nalishidagi jozibador individlarni tanlash usulidir deyish mumkin [14]. Bu usul, ayniqsa, chidamli turlarni yaratish uchun yaxshi samara beruvchi usuldir [15]. G‘o‘zaning hali nihollik davrlaridayoq spesifik markerlarlar yordamida chidamli genotiplarni ajratib olish mumkin [16]. Chidamli navlarni ekish, paxta hosilining oshishi va tannarxning keskin tushushiga paxtadan olinadigan foydaning oshishiga olib keladi [17; 18].

Tadqiqot davomida Fibre Verte namunasi o‘rgimchakkana bilan zararlanishga bardoshli namuna ekanligi, Omad navi esa o‘rgimchakkana bilan zararlanishga chidamsiz, lekin ishlab chiqarish talablariga mos qimmatli-xo‘jalik belgilariga ega tezpisharligi aniqlangan. Omad navi va Fibre Verte namunasi 2020 yilda o‘zaro chatishtirilib Omad × Fibre Verte kombinatsiyasi olingan. F_1 (Omad × Fibre Verte) o‘simlikarida qimmatli-xo‘jalik belgilarini irsiylanishi o‘rganilganda bosh poya balandligi (0,78) belgishi bo‘yicha oraliq ijobiy dominantlik holati kuzatildi.

1-jadval

F_1 (Omad × Fibre Verte) o‘simlikarida qimmatli xo‘jalik belgilarini irsiylanishi (2021 yil)

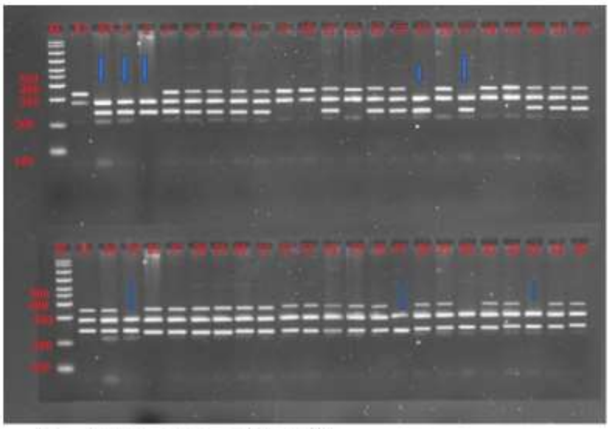
1	Ota-ona shakllari va duragay nomi	Bosh poya balandligi, sm	hp	Bir ko‘sakdagi paxta vazni, g	hp	Bir tup o‘simlikdàgi ko‘sak soni, dona	hp
1	Omad	80±3,1		4,98±0,3		10,50±3,43	
2	Fibre Verte	125±2,3		5,4±0,2		13,10±3,35	
3	F_1 (Omad × Fibre Verte)	120±3,5	0,78	5,7±0,2	2,43	14,35±2,44	1,96

Bir dona ko‘sakdagi paxta vazni (2,43) belgisi bo‘yicha va bir tup o‘simlikdagi ko‘sak soni (1,96) belgisi bo‘yicha ijobiy to‘liq dominantlik holati kuzatildi (1-jadvalga qarang). F_2 (Omad × Fibre Verte) kombinatsiyasining 46 ta o‘simliklaridan genom DNK si ajratilib, BNL 1705 SSR markeri yordamida PZR tahlillari qilinganda genotipik ajralish kuzatildi. PZR tahlillari natijalariga ko‘ra 6 ta (13,04 %) o‘simlik a genotip gomozigota, 8 ta (17,39 %) o‘simlik b genotip gomozigota, 32 ta (69,56 %) o‘simlik geterozigota holatda ekanligi aniqlandi (2-rasmga qarang).

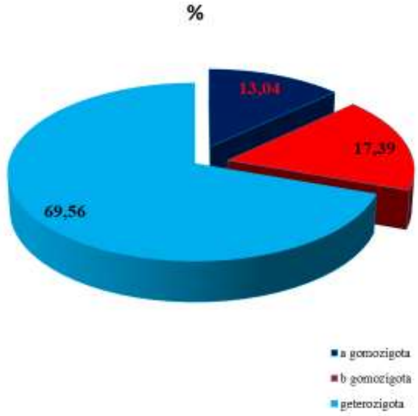
F_2 (Omad × Fibre Verte) o‘simliklari va ota-ona shakllarining o‘rgimchakkanaga bardoshliligi baholanganda Omad navida 35,9 % o‘rgimchakkana bilan zararlanganligi kuzatildi.

Fibre Verte namunasida esa o‘rgimchakkana bilan zararlanish kuzatilmadi. F_2 (Omad × Fibre Verte) G/11 (20%), F_2 (Omad × Fibre Verte) G/9 (15 %), F_2 (Omad × Fibre Verte) G/8,

F_2 avlodlarda genotipik ajralish



Omad × Fibre Verte BNL 1705



2-rasm. Omad × Fibre Verte duragay kombinatsiyasining F_2 avlod o`simliklarida PZR tahlillari natijalariga ko‘ra aniqlangan genotipik ajralish 6 ta (13,04 %) o‘simlik “a” genotip gomozigota, 8 ta (17,39 %) o‘simlik “b” genotip gomozigota, 32 ta (69,56 %) “h” o‘simlik geterozigota holati.

Omad × Fibre Verte duragay kombinatsiyasining F_2 avlod o`simliklarida PZR tahlillari natijalariga ko‘ra aniqlangan genotipik ajralish 6 ta (13,04 %) o‘simlik “a” genotip gomozigota, 8 ta (17,39 %) o‘simlik “b” genotip gomozigota, 32 ta (69,56 %) “h” o‘simlik geterozigota holatda ekanligi aniqlandi.

F_2 (Omad × Fibre Verte) G/10, F_2 (Omad × Fibre Verte) G/15, F_2 (Omad × Fibre Verte) G/46, F_2 (Omad × Fibre Verte) G/36, F_2 (Omad × Fibre Verte) G/45 genotiplar 10 % gacha o‘rgimchakkana bilan zararlanganligi kuzatildi. bardoshli F_2 (Omad × Fibre Verte) kombinatsiyasining boshqa o‘simliklarida o‘rgimchakkana bilan zararlanishi kuzatilmadi (3-rasmga qarang). F_2 (Omad × Fibre Verte) kombinatsiyasidan tanlab olingan 46 ta genotiplarning o‘zgaruvchanligi 2-jadvalda keltirilgan. Bu genotiplar 2023 yilda dala sharoitida ekildi va F_3 (Omad × Fibre Verte) oilalar olindi. O‘rgimchakkana bilan zararlanishga chidamlilik belgisi bo‘yicha gomozigota va geterozigota holatdagi genotiplar ekilib oila ko‘rinishida o‘rganilgan.

O‘rgimchakkana bilan zararlanish belgisi bo‘yicha gomozigota holatdagi F_3 (Omad × Fibre Verte) G/1, F_3 (Omad × Fibre Verte) G/2, F_3 (Omad × Fibre Verte) G/8, F_3 (Omad × Fibre Verte)

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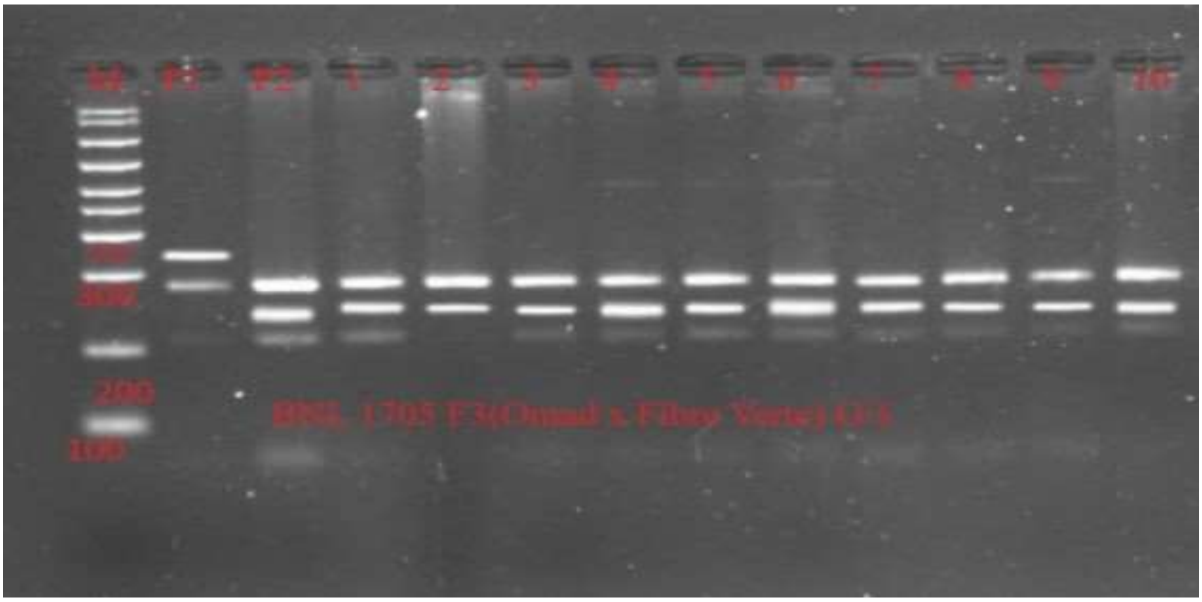
G/9, F_3 (Omad × Fibre Verte) G/11,



3-rasm. BNL 1705 DNK marker yordamida F3 (Omad × Fibre Verte) G/1 genotipini O‘rgimchakkana bilan zararlanishga bardoshlilik belgisi bo‘yicha gomozigota holati.

F_3 (Omad × Fibre Verte) G/14, F_3 (Omad × Fibre Verte) G/15, F_3 (Omad × Fibre Verte) G/16, F_3 (Omad × Fibre Verte) G/17, F_3 (Omad × Fibre Verte) G/18, F_3 (Omad × Fibre Verte) G/24, F_3 (Omad × Fibre Verte) G/37, F_3 (Omad × Fibre Verte) G/40, F_3 (Omad × Fibre Verte) G/42, genotiplar oilasi o‘simliklaridan genom DNK ajratilib BNL 1705 DNK markeri yordamida tekshirilganda o‘rgimchakkana bilan zararlanishga bardoshlilik belgisi bo‘yicha genotipik ajralish kuzatilmagan (3-rasmga qarang) va ushbu oilalar o‘rgimchakkana bilan zararlanishga bardoshlilik belgisi bo‘yicha gomozigota holatda ekanligi yana bir bor tasdig‘ini topdi. Omad × Fibre Verte kombinatsiyasining o‘rgimchakkana bilan zararlanishga chidamlilik belgisi bo‘yicha gomozigota holatdagi genotiplar ekilib oila ko‘rinishida o‘rganilganda F_3 o‘simliklari BNL 1705 DNK marker yordamida tekshirilganda genotipik ajralishlar aniqlanmadi. Bundan ko‘rinib turibdiki F_2 avlod o‘simliklaridan o‘rgimchakkana bilan zararlanishga bardoshlilik belgisi bo‘yicha DNK markerlari yordamida tanlab olingan genotiplar keyigi avlodlarida bu belgi bo‘yicha ajralishga uchramadi. Omad × Fibre Verte kombinatsiyasidan olingan 46 oilalarning qimmatli-xo‘jalik belgilar tahlil qilinganda o‘rgimchakkana bilan zararlanishga bardoshlilik belgisi bo‘yicha gomozigota holatdagi F_3 (Omad × Fibre Verte) O/1 (124,5 sm), F_3 (Omad × Fibre Verte) O/40 (120,4 sm) va F_3 (Omad × Fibre Verte) O/2 (120,1 sm) oilalari bosh poya balandligi belgisi bo‘yicha andoza Sulton va C-6524 navlari va ota-ona shakllariga nisbatan ustunlikka erishdi (4.14-jadvalga qarang).

Bir tup o‘simlikdagi ko‘saklar soni belgisi bo‘yicha F_3 (Omad × Fibre Verte) O/24 (19,4 dona), F_3 (Omad × Fibre Verte) O/40 (20,4 dona), F_3 (Omad × Fibre Verte) O/42 (18,7 dona), F_3 (Omad × Fibre Verte) O/16 (19,7 dona) oilalari andoza navlar va ota-ona shakllariga nisbatan ijobiy ustunlikga ega bo‘ldi.

Xulosa. Ota-ona shakllari sifatida tanlangan namunalar chidamlilik belgisiga birikkan DNK markerlari yordamida PZR skrining qilinganda o‘rgimchakkana bilan zararlanishga bardoshli va sezgir navlar orasida o‘zaro polimorfizm mavjudligi aniqlangan.

So‘ruvchi zararkunandalarga chidamlilikka birikkan BNL1705, NAU922 SSR markerlari o‘rgimchakkana bilan zararlanishga chidamlilik geniga ham bog‘langanligi aniqlangan.

O‘rgimchakkana bilan zararlanishga chidamli va sezgir namunalar o‘zaro chatishtirilib olingan duragay kombinatsiyalarda chidamlilik belgisi dominantlik qildi.

Duragay kombinatsiyalarning ikkinchi avlodida fenotipik va genotipik ajralishlar sodir bo‘lgan. DNK markerlari yordamida chidamlilik allellariga ega F_2 avlod o‘simliklari orasidan New Impr × Namàngan 77-5/G, New Impr × Namangan 77-14/G, New Impr × Namangan 77-15/G, New Impr × Namangan 77-20/G, New Impr × Namangan 77-23/G, Upland × Omad-19/G, Upland × Omad-33/G, Upland × Omàd-35/G genotiplar tanlab olingan. O‘rgimchakkana bilan zararlanishga bardoshli bo‘lgan boshlang‘ich ashyolar yaratilgan.

Omad × Fibre Verte duragay kombinatsiyasining F_2 avlodlaridan BNL 1705 DNK marker yordamida ajratib olingan, o‘rgimchakkana bilan zararlanishga bardoshli genotiplar 2023 yida oila shaklida ekilib, PZR skrining qilinganda F_3 (Omad × Fibre Verte) O/1, F_3 (Omad × Fibre Verte) O/2, F_3 (Omad × Fibre Verte) O/37, F_3 (Omad × Fibre Verte) O/42, F_3 (Omad × Fibre Verte) O/40, F_3 (Omad × Fibre Verte) O/24, F_3 (Omad × Fibre Verte) O/16, F_3 (Omad × Fibre Verte) O/14 oilalari o‘simliklari o‘rgimchakkana bilan zararlanishga bardoshlilik belgisi bo‘yicha gomozigota holatda ekanligi aniqlangan. Omad × Fibre Verte duragay kombinatsiyasida F_2 avlod o‘simliklaridan DNK marker yordamida belgilar bo‘yicha gomozigota genotiplarni ajratib olish mumkinligi tasdiqlangan.

2-jadval.

Omad x Fibre Verte kombinatsiyasi F_2 o‘simliklarining belgilar bo‘yicha o‘zgaruvchanligi, (2022 yil)

Belgilar	Namuna nomi	O‘rtacha	SD	Skewness	Kurtosis	CV %	Min.	Med.	Max.
O‘simlik bo‘yi, sm	Omad	70,13	14,48	0,75	0,71	0,21	45	70	105
	Fibre verte	117,63	21,54	0,03	-0,69	0,18	75	118	160
	RILs	108,54	14,54	0,62	3,73	0,13	65	110	155
Bitta o‘simlikdagi hosil shoxlari soni, dona	Omad	10,50	3,43	0,87	1,73	0,33	5	10,5	22
	Fibre verte	13,10	4,00	1,03	0,49	0,31	8	12	24
	RILs	14,35	2,04	0,38	0,26	0,14	10	14	20
Bitta o‘simlikdagi ko‘sak soni, dona	Omad	13,08	2,63	-0,47	0,31	0,20	7	14	19
	Fibre verte	9,83	2,93	-0,11	-0,93	0,30	5	10	15
	RILs	14,80	3,62	0,31	0,23	0,24	8	15	24
hs, bo‘g‘in	Omad	4,98	1,17	0,05	-0,83	0,23	3	5	7
	Fibre verte	5,40	1,63	-0,24	0,21	0,30	2	5,5	9
	RILs	6,19	1,33	0,88	0,37	0,21	4	6	10
		Ekf=0,05	R^2=0,50	P=0,0000					

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VOLUME 3 / ISSUE 9 / UIF:8.2 / MODERNSCIENCE.UZ

3-jadval.

Omad × Fibre Verte kombinatsiyasidan olingan oilalarning qimmatli-xo'jalik belgilari, 2023 yil

Nomlanishi	Bosh poya balandligi, sm	Bir tup o'simlikdagi ko'saklar soni, dona	Bitta ko'sakdagi paxta vazni, g	Tola uzunligi, mm	Tola chiqimi, %	Mahsuldorligi, g	Genotip
Sulton	75,3±10,7	13,55±0,7	5,1±0,3	34,7±0,2	34,5	69,1	
C-6524	85,3±3,9	11,3±0,9	5,3±0,2	34,1±0,6	35,5	59,9	
Omad	70,1±5,5	17,4±1,5	6,6±0,3	35,8±0,9	35,6	114,8	
Fibre Verte	117,6±5,2	13,1±1,2	3,9±0,3	33,4±0,9	22,8	51,1	
F3(Omad × Fibre Verte)O/1	124,5±1,0	15,4±1,0	4,4±0,6	34,3±0,3	34,7	67,8	b
F3(Omad × Fibre Verte)O/2	120,1±3,8	15±0,8	4,2±0,2	33,7±0,5	34,3	63,0	b
F3(Omad × Fibre Verte)O/3	123,3±5,7	15,3±0,7	4,9±0,4	32,2±0,6	33,5	75,0	h
F3(Omad × Fibre Verte)O/4	104,0±1,4	20,4±1,4	4,0±0,3	29,6±0,5	34,2	81,6	h
F3(Omad × Fibre Verte)O/5	105,4±1,4	19,4±1,4	5,0±0,2	31,1±0,3	35,5	97,0	h
F3(Omad × Fibre Verte)O/6	105,4±1,5	19,4±1,5	5,1±0,4	34,9±1,1	33,6	98,9	h
F3(Omad × Fibre Verte)O/7	95,7±8,5	19,7±1,5	5,2±0,3	31,0±1,2	27,8	102,4	h
F3(Omad × Fibre Verte)O/8	85,4±7,5	13,4±1,5	6,2±0,4	35,2±0,5	35,9	83,1	a
F3(Omad × Fibre Verte)O/9	78,1±8,2	12,1±1,2	6,7±0,3	35,7±1,2	36,1	81,1	a
F3(Omad × Fibre Verte)O/10	110,4±5,0	15,4±1,0	5,4±0,2	33,3±1,2	36,2	83,2	h
F3(Omad × Fibre Verte)O/11	75,5±4,9	14,5±0,9	6,3±0,3	34,8±1,5	37,1	91,4	a
F3(Omad × Fibre Verte)O/12	115,3±3,7	15,3±0,7	3,9±0,5	36,2±1,6	27,6	59,7	h
F3(Omad × Fibre Verte)O/13	110,4±1,4	20,4±1,4	5,0±0,2	33,6±0,8	29,8	102,0	h
F3(Omad × Fibre Verte)O/14	120,4±1,4	19,4±1,4	4,1±0,5	34,1±0,7	34,5	79,5	b
F3(Omad × Fibre Verte)O/15	90,3±1,5	19±1,5	6,2±0,4	34,4±1,3	36,5	117,8	a
F3(Omad × Fibre Verte)O/16	115,7±1,5	19,7±1,5	4,5±0,3	34,0±0,6	35,8	88,7	b
F3(Omad × Fibre Verte)O/17	85,4±2,5	13,4±1,5	5,2±0,3	35,2±1,2	37,1	69,7	a
F3(Omad × Fibre Verte)O/18	80,1±3,2	12,1±1,2	5,7±0,2	35,7±1,2	38,2	69,0	a
F3(Omad × Fibre Verte)O/19	115,4±1,0	15,4±1,0	5,4±0,2	29,3±1,03	34,5	83,2	h

3-jadval davomi

F_3(Omad × Fibre Verte)O/20	120±2,8	15±0,8	5,2±0,1	33,7±1,2	33,0	78,0	h
F_3(Omad × Fibre Verte)O/21	125,3±4,7	15,3±0,7	4,9±0,3	32,2±1,3	29,2	75,0	h
F_3(Omad × Fibre Verte)O/22	120,4±1,4	20,4±1,4	5,0±0,2	32,6±1,2	33,5	102,0	h
F_3(Omad × Fibre Verte)O/23	110,8±1,72	19,8±1,7	5,4±0,1	32,3±1,5	32,5	106,9	h
F_3(Omad × Fibre Verte)O/24	105,4±1,5	19,4±1,5	4,1±0,3	34,9±0,9	35,6	79,5	b
F_3(Omad × Fibre Verte)O/25	110,7±1,5	19,7±1,5	5,2±0,2	34,0±0,8	29,6	102,4	h
F_3(Omad × Fibre Verte)O/26	75,9±1,3	13,9±1,1	4,9±0,3	35,3±0,2	34,2	68,1	h
F_3(Omad × Fibre Verte)O/27	75,1±2,3	13,1±2,3	4,2±0,1	34,5±0,8	37,0	55,0	h
F_3(Omad × Fibre Verte)O/28	115,9±1,0	15,9±0,9	4,4±0,3	35,6±0,6	38,3	70,0	h
F_3(Omad × Fibre Verte)O/29	75,6±0,7	14,6±0,8	5,1±0,3	37,4±0,7	32,0	74,5	h
F_3(Omad × Fibre Verte)O/30	85,3±0,7	15,3±0,7	4,9±0,4	36,2±0,4	31,2	75,0	h
F_3(Omad × Fibre Verte)O/31	120,2±1,5	20,2±1,6	5,2±0,3	30,9±0,3	29,6	105,0	h
F_3(Omad × Fibre Verte)O/32	111,4±1,4	19,4±1,4	4,0±0,2	35,1±0,5	34,2	77,6	h
F_3(Omad × Fibre Verte)O/33	108,4±1,5	18,4±1,5	5,2±0,3	31,8±0,6	37,0	95,7	h
F_3(Omad × Fibre Verte)O/34	110,5±1,5	19,5±1,5	5,1±0,5	35,6±0,5	38,3	99,5	h
F_3(Omad × Fibre Verte)O/35	103,7±1,8	13,7±1,8	5,6±0,5	32,9±0,8	32,0	76,7	h
F_3(Omad × Fibre Verte)O/36	120,7±1,2	12,7±1,2	5,7±0,4	33,4±0,15	29,8	72,4	h
F_3(Omad × Fibre Verte)O/37	125,4±1,1	15,4±1,0	4,4±0,4	34,3±0,5	36,5	67,8	b
F_3(Omad × Fibre Verte)O/38	105±0,8	15±0,8	5,2±0,3	37,7±0,7	37,2	78,0	h
F_3(Omad × Fibre Verte)O/39	105,8±1,0	14,8±0,9	3,4±0,4	31,4±1,2	33,0	50,3	h
F_3(Omad × Fibre Verte)O/40	120,4±1,4	20,4±1,4	5,0±0,5	33,6±1,5	35,2	102,0	b
F_3(Omad × Fibre Verte)O/41	115,8±1,6	19,8±1,6	2,3±0,2	29,4±1,7	36,2	45,5	h
F_3(Omad × Fibre Verte)O/42	108,7±1,6	18,7±1,6	4,3±0,1	35,4±0,8	32,1	80,4	b
F_3(Omad × Fibre Verte)O/43	109,7±1,5	19,7±1,5	2,8±0,5	31,0±0,6	35,8	55,2	h
F_3(Omad × Fibre Verte)O/44	106,7±2,6	16,7±2,6	3,6±0,6	33,7±1,4	36,2	60,1	h
F_3(Omad × Fibre Verte)O/45	104,1±3,2	14,1±3,2	4,5±0,5	31,8±1,8	34,5	63,5	h
F_3(Omad × Fibre Verte)O/46	106,2±2,1	16,2±2,1	3,0±0,3	28,6±1,9	35,3	48,6	h
						Ekf=0,64; Ekf%=0,87	

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