PAXTA G'ARAMLARINING YONG'INGA XAVFLI KO'RSATKICHLARINI MASOFADAN NAZORAT QILUVCHI QURILMA

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KALIT SO'ZLAR

masofadan nazorat, paxta g'arami, yong'in xavfi, simsiz aloqa, monitoring tizimi, sensorlar, SMS-xabar, veb-ilova.

ANNOTATSIYA

Maqolada ishlab chiqilgan masofadan paxta g'aramlarining yong'inga xavfli ko'rsatkichlarini nazorat qiluvchi qurilma tavsiflari keltirilgan. Qurilma paxtani uzoq muddat yaxshi va sifatli saqlashni to'g'ri tashkil etish uchun yong'inga xavfli ko'rsatkichlarini (harorat va hakazo) doimiy o'lchash hamda nazorat qilib borishda foydalaniladi. Ushbu qurilma real sharoitlarda amaliyotda tajribalar o'tkazilgan, olingan natijalari tahlil etilgan. Qurilma paxta xomashyosi sifatiga salbiy ta'sirlarni kamaytirish hamda yong'in xavfining oldini olish imkonini beradi.

I.Kirish

O'zbekiston paxta maskanlarida paxtaning harorati va namligini qurilmalar yordamida ma'sul xodimlar kunlik qayd etib borishlari hamda qurilmalardagi ko'rsatgichlarni belgilangan shaklda yozib borish orqali monitoring qilishmoqda. Shu jumladan, ochiq va yopiq turdagi omborxonalarda saqlanadigan paxta g'aramlarining sifatli, yong'inga xavfsiz saqlash uchun chigitli paxtanining harorati hamda namligini doimiy o'lchash talab etiladi. Nazorat qilish va o'lchash uchun turli xil qurilmalardan foydalaniladi [1-2]. Qurilmalar yordamida o'lchovlar olib borish va ko'rsatgichlarni aniqlash, me'yoriy holatdan oshganda belgilangan chora tadbirlarni amalga oshirish zarur hisoblanadi. Aksariyat holatlarda o'lchov qurilmalarning ko'pligi, ulardan natijalarini olish uchun ketadigan vaqt, olingan o'lchov natijalarini qiymatlarini hisoblash, ortiqcha ishchi kuchi, qo'l mehnati, nazorat qilishni murakkablashtiradi [3-4]. Bundan tashqari, salbiy holatlar aniqlanganda, tezkor qaror qabul qilish, bartaraf etish juda muhim hisoblanadi. Ishlab chiqarish korxonalari, omborxonalar, issiqxonalarda masofadan monitoring tizimi qo'llanilishi orqali ish unumdorligini oshirishga xizmat qiladi [6].

II.Asosiy qism

Paxta g'aram maydonlarining o'lchamlari 25×14 m, balandligi yer sathidan 0,4 m bo'lishi va yog'ingarchilikdan hosil bo'lgan suvlarni chiqib ketishini ta'minlash uchun 0,05-0,07 m ga ko'tarish kerak [7]. Paxtani uzoq muddat yaxshi va sifatli saqlashni to'g'ri tashkil etish maqsadida paxtani qabul qilish davrida, uning namligini hisobga olgan holda guruhlarga ajratib olinadi. Bunda namlik 14 foizgacha bo'lganda g'aramlarga jamlash mumkin. Paxta g'aramlarga jamlanganda texnik tavsiflari quyida keltirilgan ko'rsatkichlardan oshib ketmasligi kerak (1-jadval) [8].

1-jadval

Paxta g'aramlarining tayyorlov davrida texnik tavsiflari

Paxta navi	*Paxta namligi, (%)*	*Paxta g'arami-ning balandligi, (metr)*	*Maydonchadagi paxta xomashyosining taxminiy massasi, (tonna)*

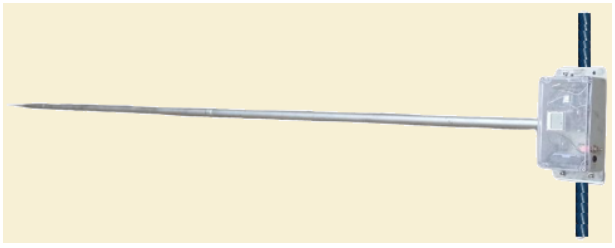
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I	9 gacha	8	400
	9,1-12,0	8	350
	12,1-14,0	7	300
	14 dan yuqori	6	250
II	10 gacha	8	370
	10,1-13,0	8	300
	13,1-16,0	7	250
	16 dan yuqori	6	200
III	11 gacha	7	350
	11,1-15,0	7	300
	15,1-18,0	6	230
	18 dan yuqori	6	200
V	13 gacha	6	270
	13,1-17,0	5	200
	17,1-20,0	4	190
V	20,1 dan yuqori	4	60-90

I va II navli saqlanayotgan paxta xomashyosining holati va harorati har 10 kunda tayyorlov punkti yoki paxta zavodi laboratoriyasi tomonidan tekshiriladi; III va IV sinflar - har 5 kunda. Tekshirishda paxta xomashyosining namligi sabablari qanday paydo bo‘lganligi aniqlanadi.

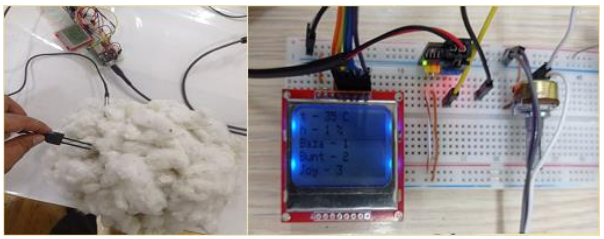
Paxta xomashyosining o‘ziga xos xususiyatlaridan biri uning yuqori gigroskopikligidir: atmosfera yoki tuproq namligini o‘ziga singdirib, uning namligini 25-30% gacha oshirishi mumkin. Bo‘sh va biroz siqilgan holatda paxta xomashyosi maxsus gigroskopiklikka ega. Shuning uchun, g‘aramlarda paxta xomashyosining haroratini vaqti-vaqti bilan tekshirish va nazorat qilish kerak bo‘ladi [9].

Paxta g‘aramlarining yong‘inga xavfli ko‘rsatkichlarini masofadan nazorat qiluvchi qurilma (fizik modeli) ishlab chiqilgan va umumiy ko‘rinishi 1-rasmda keltirilgan [1].



1-rasm. Paxta g‘aramlarining yong‘inga xavfli ko‘rsatkichlarini masofadan o‘lchash qurilmasining fizik modeli

2-rasmda paxta g‘aramlarining yong‘inga xavfli ko‘rsatkichlarini masofadan o‘lchash qurilmaning tayyorlashdagi jarayoni, 3-rasmda paxta g‘aramining yong‘inga xavfli ko‘rsatkichlarini masofadan nazorat qurilmasining o‘lchash jarayoni ko‘rinishi keltirilgan.



2-rasm. Paxta g‘aramlarining yong‘inga xavfli ko‘rsatkichlarini masofadan o‘lchash qurilmaning ishlab chiqishdagi jarayonlar



3-rasm. Paxta g‘aramining yong‘inga xavfli ko‘rsatkichlarini masofadan nazorat qurilmasining amaliyotda o‘lchash jarayoning ko‘rinishi

Masofadan nazorat qilish qurilmasining ishlash algoritmi [1] asosida paxta g‘aramining yong‘inga xavfli ko‘rsatkichlarini o‘lchash atrof

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muhitning ta'siri, yaratilgan ushbu qurilmaning o'lchov natijalarini hisobga olgan holda o'z vaqtida xabar berish, zaruriy holatlarda tegishli choralarni amalga oshirish, eng muhimi simsiz texnologiyalar asosida avtomatlashtirilgan tizim ishlashiga erishiladi. Tizim ishlashiga bog'liq barcha parametrlar to'liq qamrab olingan. Ushbu qurilmaning ishlash algoritmi simsiz tarmoqlardan foydalangan holda ishlash rejimlarini sozlash, harorat va namlikni o'lchash, baholash, oldindan bashorat qilish va saqlanayotgan xomashyo sifatiga salbiy ta'sirlarni kamaytirish hamda yong'in xavfining oldini olish uchun keng foydalanish mumkin [10-11].

Qurilma bir vaqtning o'zida paxta g'aramidagi yong'inga xavfli ko'rsatkichlarini aniqlash, ma'lumotni veb serverga yuborish va uning monitoringini olib borish ko'rsatgichlari bo'yicha O'zbekiston sharoitida foydalanishga mos keladi[12-13].

Kuzatilayotgan paxta g'aramlarining yong'inga xavfli ko'rsatkichlari bir kunda bir marotaba o'lchash yetarli hisoblanadi. Ishlab chiqilgan masofadan nazorat qurilmasi kunlik o'lchovlar bilan birga, ko'rsatgichlar belgilangan me'yordan ortishi yoki kamayishi vaqtida ham tizim talabini inobat olgan holda ishlab chiqildi [14].

III.Natijalar

Ishlab chiqilgan qurilma agro klasster paxta qabul qilish maskanlarida tajriba sinovlardan o'tkazildi. Ushbu qurilmani hozirgi vaqtda paxta maskanlarida foydalanilayotgan TE-100 termoshup bilan [15] haroratni o'lchashda o'rnatilish vaqtini solishtirilgan va olingan o'chov natijalari 2-jadval keltirilgan.

2-jadval

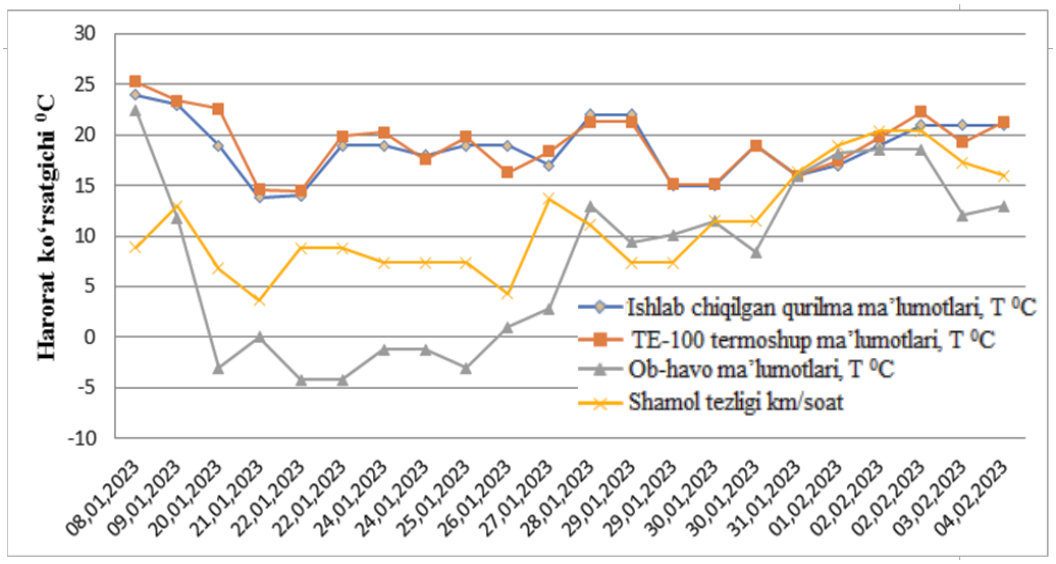
Olib borilgan tajriba-sinov o'lchovlar natijalari

O'lchov o'tkazil-gan vaqt	*Paxta navi*	*Ishlab chiqilgan qurilma ma'lumo-tlari, T ^0C*	*TE-100 termoshup ma'lumot-lari, T ^0C*	*Ishlab chiqilgan qurilma ma'lumotlar i, namlik, %*	*Ob-havo ma'lumot -lari, T ^0C*	*Shamol tezligi km/soat*	*Ob-havo ma'lumot-lari, nisbiy namlik, %*
08.01. 2023	*Buxoro-6*	*24*	*25,3*	*9*	*22,5*	*8,2*	*10*
09.01. 2023	*Buxoro-6*	*23*	*23,4*	*9*	*11,8*	*13*	*51*
20.01. 2023	*Buxoro-102*	*19*	*22,6*	*8,5*	*-3*	*6,8*	*66*
21.01. 2023	*Porloq-4*	*13,8*	*14,6*	*8*	*0*	*3,7*	*10*
22.01. 2023	*Porloq-4*	*14*	*14,5*	*8*	*-4,2*	*8,8*	*10*
22.01. 2023	*Buxoro-102*	*19*	*19,9*	*8,5*	*-4,2*	*8,8*	*10*
24.01. 2023	*Buxoro-102*	*19*	*20,3*	*8,5*	*-1,2*	*7,4*	*10*
24.01. 2023	*Porloq-4*	*18*	*17,6*	*8*	*-1,2*	*7,4*	*10*
25.01. 2023	*Porloq-4*	*19*	*19,8*	*8*	*-3*	*7,4*	*10*
26.01. 2023	*Porloq-4*	*19*	*16,3*	*8*	*1*	*4,3*	*54*

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27.01. 2023	Buxoro-6	17	18,4	9	2,8	13,7	59
28.01. 2023	Buxoro-6	22	21,3	9	13	11,1	23
29.01. 2023	Buxoro-6	22	21,3	9	9,4	7,4	51
29.01. 2023	Porloq-4	15	15,1	8	10,1	7,4	45
30.01. 2023	Porloq-4	15	15,1	8	11,5	11,5	51
30.01. 2023	Buxoro-102	19	19	8,5	8,4	11,5	62
31.01. 2023	Buxoro-102	16	16	8,5	16	16,3	42
01.02. 2023	Buxoro-102	17	17,5	8,5	18,2	19	49
02.02. 2023	Porloq-4	19	19,8	8	18,6	20,4	47
02.02. 2023	Porloq-4	21	22,3	8	18,6	20,4	47
03.02. 2023	Porloq-4	21	19,3	8	12,1	17,3	71
04.02. 2023	Porloq-4	21	21,3	8	13	16	50

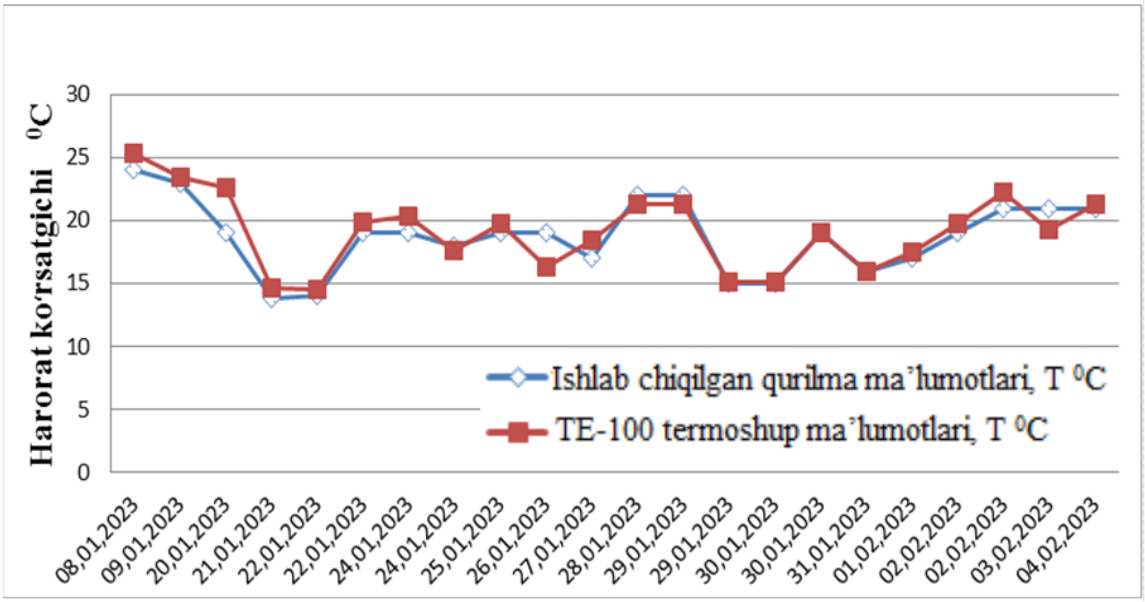
Qurilmalardan olingan natijalar paxta g'aramlarining haroratini o'lchashda $\pm 1^0$C gacha o'lchov xatoligi mavjudligini ko'rsatdi. Ammo, ishlab chiqilgan qurilmaning amaliyotga tajriba-sinov davrda natijani olishda kam vaqt talab etilishi hamda masofadan monitoring qilish tizimiga ma'lumotlarni uzatishi bilan ham mavjud TE-100 qurilmadan ustunlik tomonlari ko'pligi bilan amaliy ahamiyatga ega.



4-rasm. Olib borilgan tajriba-sinovlarda paxta g'aramlarining yong'inga xavfli ko'rsatkichlarining o'lchovlar grafigi

5-rasmda ishlab chiqilgan qurilma hamda TE-100 rusumli termoshup [8] qurilmasini bilan paxta g'aramlarining haroratini o'lchashning taqqoslanishi keltirilgan.

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5-rasm. Paxta g'aramlarining haroratini ishlab chiqilgan qurilma va TE-100 termoshup orasida o'zaro qiyosiy o'lchov tajriba-sinov grafigi

Har bir tekshiruv natijalari paxta qabul qilish maskanining maxsus jurnalida qayd etiladi. Paxta g'aramlarda saqlanayotgan xomashyo harorat o'lchagich yordamida 3-4 metr chuqurlikda, ombor va shiyponlarda - yuqoridan to'rt burchakdan burchakdan 2 metr masofada va yarim paxta xom paxta chuqurligida [16-17]. TE-100 termoshupi yordamida paxta g'aramlarning haroratini o'lchov natijalarini 30-35 daqiqa davomida olish mumkin [18]. Paxta haroratini o'lchashda TE-100 termoshup qurilmasi va ishlab chiqilgan qurilmada haroratni olib borilgan qiyosiy tajtiba-sinov natijalari 3-jadvalda va solishtirish grafiklari 6-rasmda keltirilgan.

3-jadval

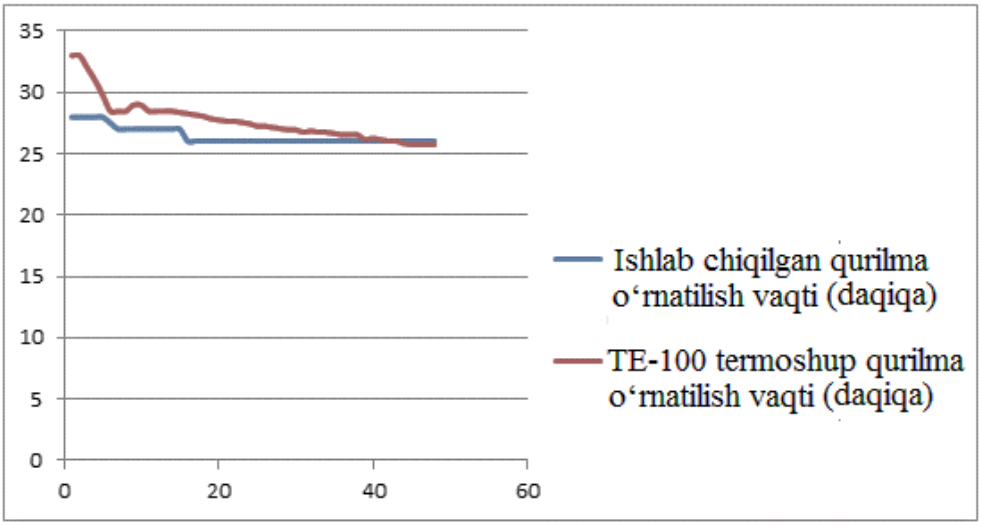
Paxta g'aramlarining haroratini o'lchashda o'rnatilish vaqtini aniqlash

O'lchov davri (daqiqa)	*O'lchov o'tkazilgan vaqt*	*Ishlab chiqilgan qurilma ma'lumotlari, T ^{0}C*	*TE-100 termoshupdan olingan natija T ^{0}C*
1	*11:38*	*28*	*33*
2	*11:39*	*28*	*33*
3	*11:40*	*28*	*32*
4	*11:41*	*28*	*31*
5	*11:42*	*28*	*29,8*
6	*11:43*	*27,5*	*28,5*
7	*11:44*	*27*	*28,5*
8	*11:45*	*27*	*28,5*
9	*11:46*	*27*	*29*
10	*11:47*	*27*	*29*
11	*11:48*	*27*	*28,5*
12	*11:49*	*27*	*28,5*
13	*11:50*	*27*	*28,5*
14	*11:51*	*27*	*28,5*
15	*11:52*	*27*	*28,4*
16	*11:53*	***26***	*28,3*
17	*11:54*	***26***	*28,2*
18	*11:55*	***26***	*28,1*
19	*11:56*	***26***	*27,9*
20	*11:57*	***26***	*27,8*
21	*11:58*	***26***	*27,7*
22	*11:59*	***26***	*27,7*
23	*12:00*	***26***	*27,6*
24	*12:01*	***26***	*27,5*
25	*12:02*	***26***	*27,3*
26	*12:03*	***26***	*27,3*
27	*12:04*	***26***	*27,2*
28	*12:05*	***26***	*27,1*
29	*12:06*	***26***	*27*
30	*12:07*	***26***	*27*
31	*12:08*	***26***	*26,8*
32	*12:09*	***26***	*26,9*
33	*12:10*	***26***	*26,8*
34	*12:11*	***26***	*26,8*
35	*12:12*	***26***	*26,7*

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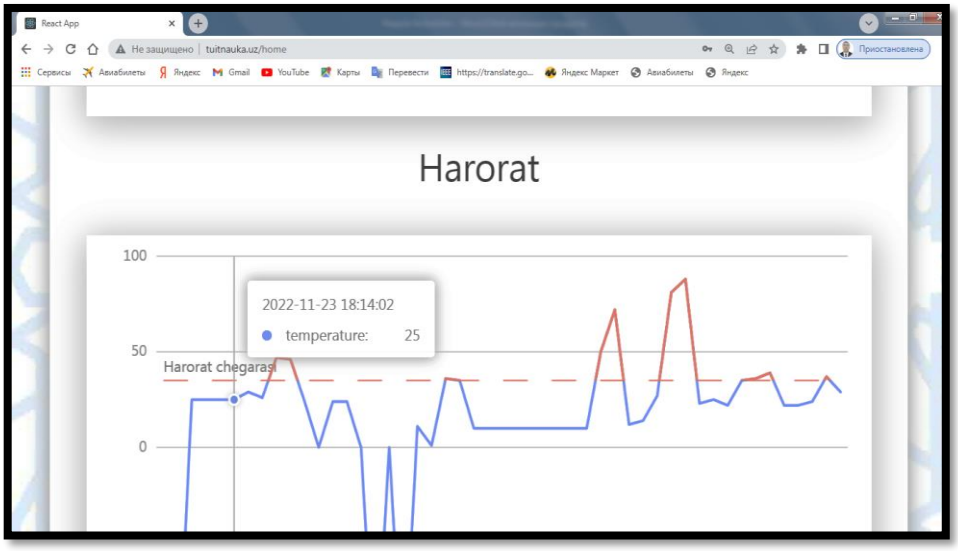
36	*12:13*	***26***	*26,6*
37	*12:14*	***26***	*26,6*
38	*12:17*	***26***	*26,6*
39	*12:20*	***26***	*26,2*
40	*12:22*	***26***	*26,3*
41	*12:23*	***26***	*26,2*
42	*12:24*	***26***	***26,1***

43	*12:27*	***26***	***26,1***
44	*12:30*	***26***	***25,9***
45	*12:36*	***26***	***25,9***
46	*12:39*	***26***	***25,9***
47	*12:42*	***26***	***25,9***
48	*12:45*	***26***	***25,9***



6-rasm. Paxta g'aramlarining haroratini ishlab chiqilgan qurilma va TE-100 termoshupdan o'lchashda vaqtini aniqlash grafigi

Ishlab chiqilgan paxta g'aramlarining yong'inga xavfli ko'rsatkichlarini masofadan o'lchash va monitoring qilish qurilmasi qo'yiladigan talablarga javob beradi. Nazoratchi kuzatilayotgan paxta g'aramlarini tanlagan holda uning joriy holatini, agar zaruriyat bo'lganda kunlik, haftalik yoki oylik hisobotni elektron shaklda tizimdan yuklab olish imkoniyati mavjud [19]. Bundan tashqari ma'lumotlar bazasida saqlanoyatgan statistik ma'lumotlarni grafik shaklida aks etiriladi (7-rasm).

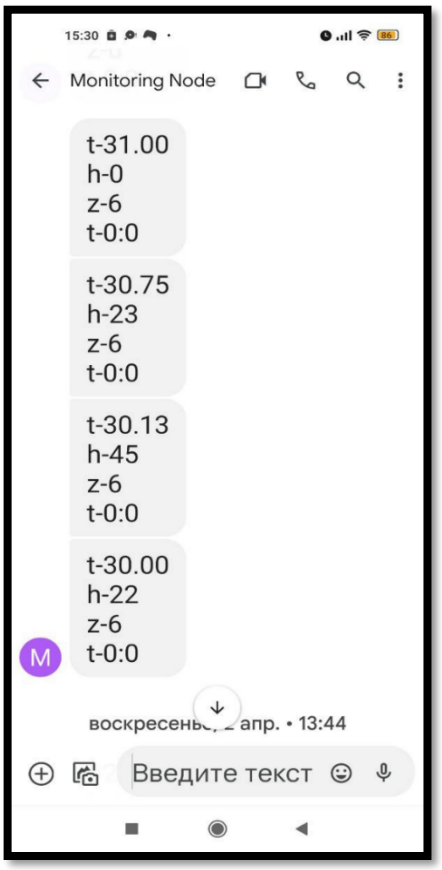


7-rasm. Kuzatilayotgan paxta g'aramlarining haroratini veb ilovada grafik ko'rinishi

Monitoring tizimida nazoratchi ixtiyoriy vaqtda ixtiyoriy paxta g'aramini tanlagan holatda yong'inga xavfli ko'rsatkichlarini, qurilmaning quvvat miqdorini ko'rishi yoki mobil qurilma

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orqali so‘rov jo‘natib SMS-xabar ko‘rinishida ma’lumot olish imkoniyat ham ishlab chiqilgan (8-rasm).





9-rasm. Paxta g‘aramlarining yong‘inga xavfli ko‘rsatkichlarini SMS-xabar va smartfon orqali veb ilovadan ma’lumot olish ko‘rinishi

IV.Muxokama

Shuningdek, belgilangan qiymatlardan ortishi yoki kamayish holatlarida avtomatik ogohlantirish vazifasi talab etiladi. Tizim operatorlarga favqulodda ogohlantirish xabarlarini SMS-xabar ko‘rinishida hamda bir vaqtning o‘zida veb ilovada ogohlantirish xabari shaklida yuboradi [20]. Ushbu xabarni qabul qilgan nazoratchi tomonidan amaliy choralar ishlab chiqish va salbiy holatlarni o‘z vaqtida barham etishga imkoniyat beradi.

V.Xulosa

Mazkur ishlab chiqilgan qurilmaning tajriba-sinovlarda ishlash imkoniyatlari, yaratilgan algoritmlar va dasturiy vositalarni qo‘llashda ishlab chiqilgan qurilma paxta g‘aramlarining yong‘inga xavfli ko‘rsatkichlarini o‘lchash imkonini beradi hamda paxta g‘aramlarining haroratini o‘lchashda o‘rnatilish vaqti ishlatilayotgan TE-100 termoshup qurilmasiga nisbatan 2,5-3 barobar tez. Qurilma monitoring tizimiga simsiz aloqa tarmoqlari orqali ma’lumotlar uzatishi paxta xomashyosi sifatli saqlash va salbiy ta’sirlarni kamaytirish hamda yong‘in xavfining oldini olish imkonini beradi.

VI.Foydalanilgan adabiyotlar

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