Effects of continuous application of Samurai and Zellek Super herbicides on cotton fields against weeds in the conditions of Uzbekistan

Umurzok Charshanbiev[1,*], *Makhkam* Shodmanov[1], *Umbetali* Sultanov[1], and *Iso* Dusbaev[1]

[1]Tashkent State Agrarian University, University str., 2, Tashkent province, 100140 Uzbekistan

Abstract. This scientific article provides data on the effectiveness of successive application of herbicides against annual and perennial weeds in cotton fields on arable lands plowed with simple and two-sided plows. When the herbicide Samurai (1.5 l/ha) is applied separately, the annual weeds are effectively lost (86.8-90.2%), and have a weak effect on perennials. When Zellek Super (1.0 l/ha) herbicide is used separately, it has a weak effect on annuals (24.0-32.0%), effectively reducing weeds. Both perennial weeds (90.5-93.0%) and perennial weeds are effective when applied in series with Samurai (1.5 l/ha) and Zellek Super (1.0 l/ha) herbicides 88.9 -93.3% loss. Cotton yield will increase by 1.8-5.4 q/ha compared to the control option. Consecutive application of Samurai (1.5 l/ha) and Samurai (1.5 l/ha) and Zellek Super (1.0 l/ha) herbicides against annual and perennial weeds is recommended.

1 Introduction

Today, cotton is grown on 33 million hectares in 84 countries around the world, with an annual yield of about 25 million tons. More than 3,000 species of weeds are prevalent in world agriculture, and 1,800 of them cause enormous economic damage, of which more than 200 species are in strong competition with major agricultural crops [1-5]. As a result of a combination of agro-technical and chemical control measures against them, high results are being achieved in the United States, Brazil, Australia, China, India, Pakistan, Germany, South Korea, Russia and a number of other countries [2, 4, 6-10].

In cotton-growing countries, surface tillage against weeds, application of herbicides before plowing and in combination with sowing of seeds, plowing the soil to a depth of 22-25 cm and application of herbicides in combination with sowing of seeds, deep once every 2-3 years (32-35 cm) [11, 14]. It was found that as a result of plowing and application of herbicides before sowing and during the period of cotton weeding, an additional 5-6 quintals of cotton per hectare is obtained. Improving the phytosanitary condition of cotton fields by agro-technical measures alone is not always possible [12, 17-21].

Turkish scientists conducted a two-year study of a total of 118 plots of cotton fields in southeastern Anatolia (Şanliufa and Mardin provinces) in Turkey in 2010-2011. The type and intensity of weeds per square meter were studied [4, 7, 13, 14]. The study found 23

* Corresponding author: umurzok.charshanbiev@yandex.com

families and 49 genera and 69 species of weeds: the most common ones were *Xanthium strumarium* L, *Physalis* sp, *Amaranthus retroflexus* L, *Sorghum halepense* L Pers, *Solanum nigrum* L, *Cyperus rotundus* L [13].

Weed identification is core of precision variable spray technology and weed information management system. Single type features are difficult to identify multi-class weeds in cotton fields. In this paper, multi-type feature fusion technique for weed identification is proposed. Firstly, multi-type features are extracted. In color feature extraction, FMS, SMS and TMS in HSI are extracted by color moment [4, 7]. In shape feature extraction, REC, RWL, CIR and SPH are extracted by geometric parameter method. In texture feature extraction, ASM, CON and COR are extracted by GLCM. Secondly, because feature dimension is too large, principle component analysis is used to reduce dimension to extract new features including COR, ASM, REC and two components. Finally, three comparative experiments including identification of five kinds of weeds, three kinds of weeds and two kinds of weeds are carried out. Experimental results show that method proposed in this paper is superior to state of the art and is suitable for identification of multi-class weeds. This method can also be applied in identifying weeds in other fields [2, 11].

This paper proposes multi-type feature fusion technique, which can solve the problem of identification of multi-class weeds in cotton fields. Firstly, Multi-type features are extracted. In color feature extraction, FMS, SMS and TMS in HSI are extracted by color moment. In shape feature extraction, REC, RWL, CIR and SPH are extracted by geometric parameter method. In texture feature extraction, ASM, CON and COR are extracted by GLCM. Secondly, dimension of feature parameters is reduced by PCA [12-14]. Feature dimension is reduced from 10 to 5 and 5 features, including COR, ASM, REC and two principle components, are regarded as new features to identify weeds. Finally, three comparative experiments are carried out. Accuracy of identification by IPCA for five kinds of weeds, three kinds of weeds and two kinds of weeds are 88%, 87.5% and 86.25% respectively, which is higher than state of the art [17-21].

A similar experiment was laid out at Students Farm, Sindh Agriculture University, Tandojam, Pakistan. Cotton variety Shahbaz-95 was treated with weed control treatments (Stomp-330 EC at 3 L ha^{-1}, Stomp-330 EC at 4 L ha^{-1}, Stomp-330 EC at 5 L ha^{-1}, Fusilade at 3 L ha^{-1}, Fusilade at 4 L ha^{-1}, hand weeding and untreated check). Among the twelve weed species observed in the cotton field *Trianthema portulacastrum* (29.56%), *Cyperus rotundus* (17.24%), *Portulaea oleracea* (14.78%) and *Digerea arvensis* (10.47%) were the dominant weeds, while other weed species were in trace. Weed population recorded before herbicide application ranged between 63.71 - 65.13 m^{-2}. Hand weeding and application of Stomp-330 EC at 5 L ha^{-1} reduced weed density significantly (92.40 and 91.59%) over other weed control measures, which in turn resulted taller plants (158.50 and 155.60 cm), exhibitedmore fruiting branches (14.09 and 13.50 $plant^{-1}$), higher productive bolls (82.39 and 80.78 $plant^{-1}$) and maximum seed cotton yield (2121.75 and 1957.50 kg ha^{-1}). All the herbicide treatments controlled the weeds. Hand weeding and application of Stomp-330 EC at 5 L ha^{-1} were more effective in controlling the weeds which resulted better growth and seed cotton yield [7, 17-21].

Another experiment is that Şanlıurfa province is an important place for Turkey's cotton production providing about half of the production. This study was carried out in Şanlıurfa to determine weed problems by determining the frequency and density of the weeds that restrict the cotton production. For this purpose, 60 cotton fields were surveyed in 2015. The most widespread species in the fields were ranked: *Sorghum halepense* (L.). Pers. (Johnson grass, 73 %), *Xanthium strumarium* L. (common cocklebur, 67 %), *Solanum nigrum* L. (black nightshade, 60 %), *Physalis philadelphica* Lam. (tomatillo, 53 %) and *Portulaca oleracea* L. (common purslane, 48 %) [4, 7, 11].

Compared with the results of similar studies carried out in the region over 25 years ago; it was observed that the weed species, their frequency and density have been changed, significantly. It is predicted that further changes will continue in the future due to increase of irrigation, changes of the cropping pattern and weed control strategies, and also global warming.

Another similar experiment was conducted in dryland conditions of the Brazilian Northeast to determine the number of viable weed seeds (seedbank) in an upland cotton crop, and its distribution in the soil profile, before and after using various herbicide treatments [17, 20, 21]. A randomized block design in a split-plot block scheme with 6 replications was used, where the main plots were constituted by a factorial (13 treatments and 2 sampling soil depths), and the subplots by 2 sampling dates. The seedbank was determined by germination of the recovered weed seeds obtained from different soil depths. The highest number of viable weed seeds in the area was found before the application of the herbicide treatments at 0 - 10 cm soil depth. The treatments metalachlor + diuron; diuron + pendimethalin and the control (no herbicide treatment, weeded weekly during the entire cotton crop cycle) were the most effective in reducing the weed seedbank in the area [16].

In order to improve the agrotechnology of cotton growing in Uzbekistan, it is important to conduct research on tillage and the use of effective herbicides in the soil to ensure the phytosanitary status of the agrophytocenosis and increase soil fertility and cotton yield.

Therefore, it is important to conduct research to determine the effectiveness of basic tillage methods and the sequential and sequential application of modern herbicides in the fight against weeds in cotton fields, as well as their widespread introduction into practice. Thus, the aim of the study is to develop agrotechnology for the production of high-quality cotton from cotton through the sequential application of herbicides with different tillage methods and areas of action in the combat against weeds in irrigated meadow alluvial soils.

2 Materials and methods

Field experiments were conducted in 2007-2010 in the alluvial soils of the experimental meadow of the Tashkent State Agrarian University, located in the Urta Chirchik district of Tashkent province, Uzbekistan.

The climate of the oasis is sharply changing, the winters are short and last 1.5-2.0 months. January average temperatures range from -3^0C to -11^0C, but in the foothills and plains the absolute low temperatures range from -30^0C to -33^0C, and in some places to -35^0C. In summer it is characterized by high temperatures. The average temperature in July is $+27$-28^0C, the absolute maximum temperature is $+44$-46^0C, the effective total temperature in most districts is 4400-4700^{0}C, the amount of atmospheric precipitation in the irrigated lands of the region is 250-400 mm per year. The main part of precipitation is observed in March and April and is almost dry in summer [20, 21].

The dynamics of reactive forms of nutrients in the soil ($N\text{-}NO_3$, P_2O_5, and K_2O) was studied. To do this, samples were taken from 0-30, 30-50 cm layers of soil; nitrogen-nitrate, reactive phosphorus, exchangeable potassium flame photometer, soil volume mass, and porosity were determined by Kachinsky in the cylindrical method before planting and at the end of the application period [17, 18].

According to the mechanical composition of the alluvial soils of the meadows of Tashkent region are mainly heavy sand, groundwater at a depth of 1.2-2.5 meters, humus content in the layer 0-30 cm 1.3%, total nitrogen content 0.120%, phosphorus 0.150%, potassium 1, 50% and the amount of their reactive forms was $N\text{-}NO_3$ 27.3 mg/kg, P_2O_5 33.8 mg/kg, and the amount of K_2O was 125 mg/kg, the soil of the experimental soils was moderately active in terms of nitrate nitrogen, reactive phosphorus [9, 10, 12].

Stomp and Samurai herbicides are sown in conjunction with seed sowing. Zellek Super herbicide was applied when the height of annual and perennial weeds was 10-15 cm; the number of weeds was taken into account after each watering. The weeds in the cotton field were accurately accounted for in 1 m^2 plots of rectangular shape marked in each option.

The accuracy and reliability of the obtained data were analyzed mathematically and statistically by B A Dospekhov's dispersion method [17, 21].

The studies (2017-2020) were conducted in 14 options, 4 repetitions, and 4 tiers. The area of each option was 7.2 m x 20.0 m = 144 m^2, and the identification area was 72.0 m^2. The total area of the experiment is 0.8064 hectares. Along with planting Samurai 33% and Stomp 33% herbicides, Zellek Super 10.4% herbicide was sprayed using a manual sprayer after the first watering of the cotton. In the experiment, cotton variety S-6524 was grown. The Scientific Research Institute of Cotton (Uzbekistan) methodology was used in the research [1,6,8] (Table 1).

Table 1. Experiment design.

#	Options		Herbicide application norms, l/ha
	Cultivation depth	**Herbicides**	
1	30 cm with ordinary cultivator	Control (without herbicides)	-
2		Stomp 33% (ethalon)	2.0
3		Samurai 33%	1.0
4		Samurai 33%	1.5
5		Samurai 33%	2.0
6		Zellek Super10.4%	1.0
7		Samurai 33% + Zellek Super 10.4%	1.5+1.0
8	30 cm with two-sided cultivator	Control (without herbicides)	-
9		Stomp 33% (ethalon)	2.0
10		Samurai 33%	1.0
11		Samurai 33%	1.5
12		Samurai 33%	2.0
13		Zellek Super 10.4%	1.0
14		Samurai 33% + Zellek Super10.4%	1.5+1.0

3 Results and discussion

3.1 Agrophysical and agrochemical properties of soil when plowing with two-sided cultivator and applying herbicides

The amount of humus in the soil at the beginning of the application period was 1.29-1.30% in the control and experimental options, slightly decreased at the end of the application period (0.03%), in the control option at the beginning of the application period $N\text{-}NO_3$-27.0 mg/kg, most in the good option it was 28.9 mg/kg. The amount of reactive phosphorus and exchangeable potassium was also slightly higher in the experimental options than in the control option. It was found that this difference between the options remained at the end of the validity period.

At the beginning of the application period when plowing to a depth of 30 cm in a normal plow. The volumetric mass of soil in layers 20-30 and 30-50 cm is 1.32, respectively; 1.33; 1.32 and 1.35 g/cm^3, soil porosity 49.2; 48.8; 49.2 and 48.1%, while the volume mass of the soil in the plowed soil at a depth of 30 cm in a two-sided plow was 1.30, respectively; 1.31; 1.31 and 1.33 g/cm^3 (Fig. 1 and 2).

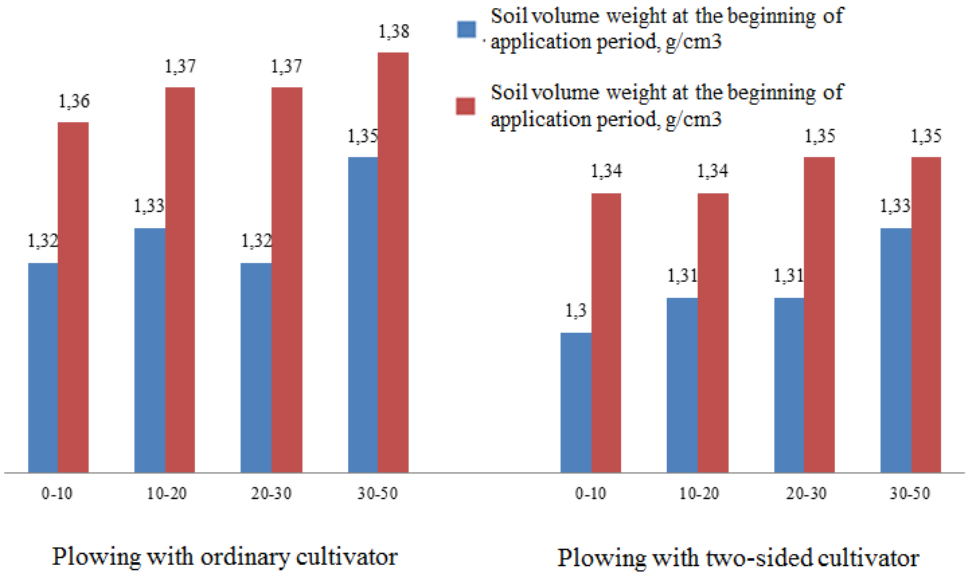

Fig. 1. Influence of plowing methods on soil volume weight (2017)

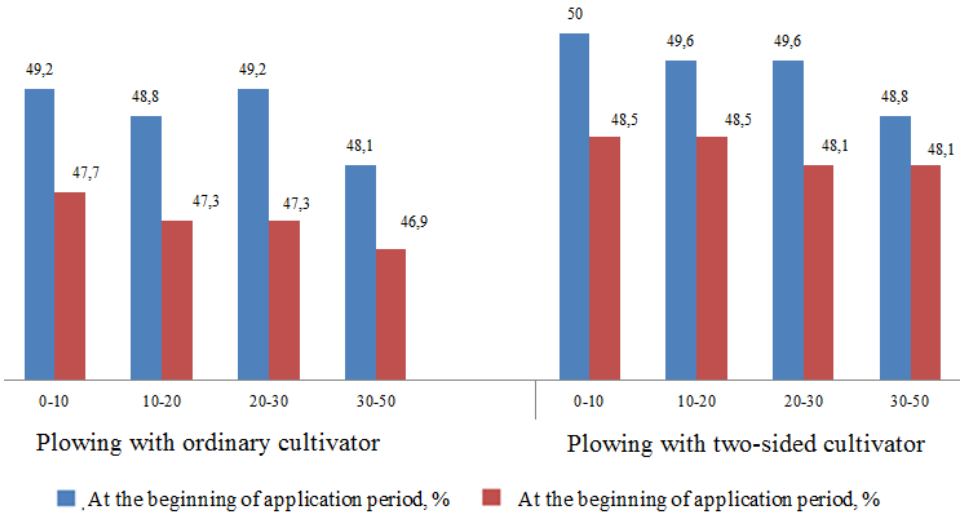

Fig. 2. Influence of plowing methods on soil porosity (2017)

3.2 Influence of plowing and herbicide application methods on weeds, and growth, development and yield of cotton

In the experimental field, annual weeds such as *Cynodon dactylon* L, *Sorghum halepence* L, *Convolvulus arvensis* L, *Cyperus rotundus* L, *Chenopodium album* L, *Echinochloa macrocarpa Vasing*, *Solonum nigrum* L, *Portulasa oleraceae* L perennials such as *Vasing* and *Amaranth* occurs. To get rid of them effectively, it is necessary to apply, apply, mix, mix or alternate herbicides with different areas of action. This is because drugs that kill

annual weeds well have a weak effect on perennials, while herbicides that effectively kill perennials have a weak effect on perennials [12].

In the field experiment (2017-2020), the number of annual weeds in the control (without herbicide) option in the first accounting period on a simple plowed field was 31.9 pieces/m^2 in 3 years, while in the options using herbicides their number was significantly reduced compared to the control option. When applied Samurai 33% preparations 1.0, annual weeds when applied at the rates of 1.5 and 2.0 l/ha are 82.8, respectively; decreased by 85.7 and 87.1%, respectively, with the Samurai 33% (1.5 l/ha) and the Zellek Super 10.4% (1.0 l/ha) used sequentially, the figure being 89.8% (Table 2).

Samurai 33% herbicide affected perennial weeds only from seeds. Perennial weeds were 3.15 pcs/m^2 in the control option. The land was plowed in a two-sided plow, the annual herbicide in the without herbicide option decreased by 30.9% in the annual herbicide and 20.6% in the perennial weed in the conventional plowed area. The highest rates of weed reduction were observed when the Samurai 33% (1.5 l/ha) and Zellek Super 10.4% (1.0 l/ha) herbicides were applied consecutively, 92.7% per year, perennials weeds decreased by 93.7%. When the 33% herbicide Samurai was applied separately at a rate of 1.5 l/ha, these figures were 85.7 and 19.0%, respectively (Table 2).

In areas plowed with a normal plow, the dry mass of annual weeds averaged 29.5 g/m^2 in the control (without herbicide) option in Report 1, while in the options using herbicides it was 2.66-24.2 g/m^2 or 18 compared to the control option. 0-91.0% decrease was taken into account. Samurai 33% herbicide 1.0; When applied at the rates of 1.5 and 2.0 l/ha, the dry mass of weeds was 80.3, respectively; 87.0 and 89.5%, while Samurai 33% (1.5 l/ha) and Zellek Super 10.4% (1.0 l/ha) were used in series, while these figures were 2.66 g/m^2 or 91.0% (Table 3).

While the dry mass of perennial weeds was 4.50 g/m^2 in the control option, their dry mass was controlled in the options using Stomp 33% (2.0 l/ha) and Samurai 33% (2.0 l/ha) herbicides decreased by 13.3-17.1% compared to Samurai was found to be reduced by 33% (1.5 l/ha) and Zellek Super 10.4% (1.0 l/ha) by 90.0% when applied consecutively (Table 3).

When plowing was carried out on a two-sided plow, there was a 25.4% decrease in the without herbicide option 8, while in the options where the herbicides were applied, there was a 30.0-93.3% decrease compared to the control option. The highest scores are Samurai 33% 1.5; When applied 2.0 l/ha (36.0; 37.8%) and Samurai 33% (1.5 l/ha) and Zellek Super 10.4% (1.0 l/ha) herbicides were applied sequentially (93.3%) were observed. Thus, when plowing the land on a two-sided plow and applying herbicides in a row, annual weeds are reduced by 89.0-94.0%, perennial weeds by 91.4-93.3%, creating favorable conditions for the growth and development of cotton (Table 3).

In the first experimental system in 2007-2010, the average yield in the control (without herbicide) option in the fields plowed with a simple plow was 26.4 q/ha, Stomp 33% herbicide 2.0 l/ha in the norm, 29.1 q/ha, Samurai 33% herbicide 1.0; 28.9 when applied at 1.5 and 2.0 l/ha; 29.5 and 29.4 q/ha, Zellek Super 10.4% to 1.0 l/ha, while Samurai Zellek Super 10.4 with 33% (1.5 l/ha) was 30.4 q/ha when applied consecutively (Table 4).

Table 2. Plowing methods and the effect of herbicides on weed species: Report 1 (June 5-11, 2017-2020).

#	Options		Herbicide application norm, l/ha	Annual weeds						Perennial weeds			
				Echinochloa makrokarpa Vasing.	*Chenopodium album L.*	*Solonum nigrum L.*	*Amaranthus blitum L.*	*Portulasa oleraceae L. Vasing*	Total	*Sorghum halepence (L.)*	*Cynodon dactylon (L.)*	*Convolvulus arvensis L.*	Total
1	Plowing with ordinary cultivator	Control (without herbicide)	-	13.2 -	5.05 -	3.95 -	5.50 -	4.20 -	31.9 -	1.25 -	1.05 -	0.85 -	3.15 -
2		Stomp 33%	2.0	1.55 88.3	0.80 84.2	0.65 83.5	1.0 81.8	0.75 82.1	4.75 85.1	1.05 16.0	0.90 14.3	0.70 17.6	2.65 15.9
3		Samurai 33%	1.0	2.00 84.8	1.15 77.2	0.75 81.0	1.05 80.9	1.05 75.0	6.00 81.2	1.10 12.0	0.95 9.5	0.75 11.8	2.80 11.1
4		Samurai 33%	1.5	1.55 88.3	0.85 83.2	0.55 86.1	0.80 85.5	0.80 81.0	4.55 85.7	1.05 16.0	0.85 19.0	0.65 23.5	2.55 19.0
5		Samurai 33%	2.0	1.40 89.4	0.70 86.1	0.50 87.3	0.80 85.5	0.70 83.3	4.10 87.1	1.00 20.0	0.80 23.8	0.70 17.6	2.50 20.6
6		Zellek Super10. 4%	1.0	5.50 58.3	4.20 16.8	3.30 16.5	5.15 6.4	3.55 15.5	21.7 32.0	0.25 80.0	0.20 81.0	0.15 82.4	0.60 81.0
7		Samurai 33% + Zellek Super 10.4%	1.5+1.0	1.05 92.0	0.65 87.1	4.00 89.9	0.60 89.1	0.55 86.0	3.25 89.8	0.15 88.0	0.10 90.5	0.10 88.2	0.35 88.9
8	Plowing with two-sided cultivator	Control (without herbicide)	-	8.80 33.3	3.75 25.7	2.75 30.4	4.00 27.3	2.75 34.5	22.05 30.9	1.00 20.0	0.85 19.0	0.65 23.5	2.50 20.6
9		Stomp 33%	2.0	1.30 90.2	0.60 88.1	0.30 92.4	0.70 87.3	0.45 89.3	3.35 89.5	0.80 36.0	0.70 33.3	0.55 35.3	2.05 34.9
10		Samurai 33%	1.0	1.55 88.3	0.75 85.1	0.50 87.3	0.80 85.5	0.50 88.1	4.10 87.1	0.85 32.0	0.75 28.6	0.60 29.4	2.20 31.2
11		Samurai 33%	1.5	1.28 90.3	0.50 90.1	0.35 91.1	0.50 90.9	0.40 90.3	3.05 90.4	0.80 36.0	0.65 38.1	0.55 35.3	2.00 36.5
12		Samurai 33%	2.0	1.20 90.9	0.45 91.1	0.25 93.7	0.55 90.0	0.30 92.9	2.75 91.4	0.75 40.0	0.60 42.9	0.45 47.1	1.80 42.9
13		Zellek Super 10.4%	1.0	4.80 63.6	3.55 29.7	2.50 36.7	4.00 27.3	2.95 29.8	17.8 44.2	0.15 88.0	0.10 90.5	0.05 94.1	0.30 90.5
14		Samurai 33% +Zellek Super 10.4%	1.5+1.0	1.00 92.4	0.40 92.1	0.20 94.5	0.40 92.7	0.33 92.1	2.33 92.7	0.10 92.0	0.05 95.2	0.05 94.1	0.20 93.7

Note: in upper case, pcs/m^2, in lower case, %

Table 3. Plowing methods and the effect of herbicides on weed dry mass (average, 2017-2020).

#	Options	Herbicide application norm, l/ha	Annual weeds						Perennial weeds					
			Report 1 (June 5-11)		Report 2 (July 4-8)		Report 3 (July 28 – August 3)		Report 1 (June 5-11)		Report 2 (July 4-8)		Report 3 (July 28 – August 3)	
			g/m²	Reduction, %	g/m²	Reduction, %	g/m²	Reduction, %	g/m²	Reduction, %	g/m²	Reduction, %	g/m²	Reduction, %
At 30 cm depth, plowing with ordinary cultivator														
1	Control (without herbicide)	-	29.5	-	20.4	-	15.5	-	4.50	-	3.75	-	2.90	-
2	Stomp 33%	2.0	4.50	85.8	3.50	82.8	2.80	82.0	3.75	16.7	3.25	13.3	2.60	10.3
3	Samurai 33%	1.0	5.80	80.3	4.50	78.0	3.72	76.0	3.90	13.3	3.34	10.9	2.63	9.0
4	Samurai 33%	1.5	3.84	87.0	3.26	84.0	2.60	83.2	3.80	15.6	3.22	14.1	2.55	12.0
5	Samurai 33%	2.0	3.10	89.5	2.65	87.0	2.33	85.0	3.73	17.1	3.18	15.2	2.52	13.0
6	Zellek Super10.4 %	1.0	24.2	18.0	17.3	15.0	13.5	12.9	0.60	86.5	0.60	84.0	0.55	81.0
7	Samurai 33% + Zellek Super 10.4%	1.5+ 1.0	2.66	91.0	2.45	88.0	2.17	86.0	0.45	90.0	0.40	89.3	0.35	87.9
At 30 cm depth, plowing with two-sided cultivator														
8	Control (without herbicide)	-	21.2	28.0	15.3	25.0	12.0	22.6	3.35	25.4	2.90	22.7	2.35	19.0
9	Stomp 33%	2.0	3.40	88.5	3.05	85.0	2.50	83.9	2.90	35.6	2.55	32.0	2.06	29.0
10	Samurai 33%	1.0	4.80	83.7	3.70	81.9	3.10	80.0	3.15	30.0	2.70	28.0	2.15	25.9
11	Samurai 33%	1.5	2.83	90.4	2.50	87.8	2.20	85.8	2.88	36.0	2.50	33.3	2.03	30.0
12	Samurai 33%	2.0	2.36	92.0	2.00	90.2	1.80	88.4	2.80	37.8	2.46	34.4	2.00	31.0
13	Zellek Super10.4 %	1.0	18.0	39.0	13.9	31.9	11.2	27.7	0.46	89.3	0.42	88.8	0.40	86.2
14	Samurai 33% + Zellek Super 10.4%	1.5+1.0	1.77	94.0	1.43	93.0	1.70	89.0	0.30	93.3	0.27	92.8	0.25	91.4

Note: Report 1: After first irrigation;
Report 2: After second irrigation;
Report 3: After third irrigation.

Table 4. Effect of two-sided cultivator and successive application of herbicides on cotton yield, q/ha (2017-2020).

#	Options	Herbicide application norms, l/ha	Productivity over years, q/ha				Average yield, q/ha	Additional yield, q/ha		
			2017	2018	2019	2020		Relative to the control	Due to two-sided plowing of the land	Due to the use of herbicides
At 30 cm depth, plowing with ordinary cultivator										
1	Control (without herbicide)	-	25.8	26.3	26.4	27.0	26.4	±0	-	±0
2	Stomp 33%	2.0	28.6	29.0	29.2	29.4	29.1	2.6	-	2.6
3	Samurai 33%	1.0	28.0	28.5	28.7	29.0	28.6	2.2	-	2.2
4	Samurai 33%	1.5	28.5	29.6	29.8	30.1	29.5	3.1	-	3.1
5	Samurai 33%	2.0	28.8	29.2	29.5	29.6	29.3	3.0	-	3.0
6	Zellek Super10.4%	1.0	28.1	28.7	29.0	28.9	28.7	2.3	-	2.3
7	Samurai 33% + Zellek Super 10.4%	1.5+1.0	29.3	30.4	30.6	31.0	30.3	4.0	-	4.0
At 30 cm depth, plowing with two-sided cultivator										
8	Control (without herbicide)	-	27.7	28.1	28.4	28.7	28.2	1.8	1.8	±0
9	Stomp 33%	2.0	29.2	30.0	30.3	30.0	29.9	3.5	0.9	1.7
10	Samurai 33%	1.0	28.7	29.6	29.3	29.8	29.5	3.0	0.8	1.2
11	Samurai 33%	1.5	29.5	30.8	31.5	31.3	30.8	4.4	1.3	2.6
12	Samurai 33%	2.0	29.6	29.7	30.8	30.5	30.2	3.8	0.8	2.0
13	Zellek Super10.4%	1.0	29.1	29.4	29.7	29.7	29.5	3.2	0.9	1.4
14	Samurai 33% + Zellek Super 10.4%	1.5+1.0	30.2	31.6	32.7	32.6	31.8	5.4	1.4	3.6
		HCP_{05}=	0.18 q/ha	0.30 q/ha	0.32 q/ha	0.21 q/ha				
		HCP_{05}=	3.0 %	3.8 %	3.8 %	2.5 %				

Among the options in areas plowed with a two-sided plow, high-yield Samurai 33% (1.5 l/ha) and Zellek Super 10.4% (1.0 l/ha) were obtained from successively applied options, averaging 31.8 q/ha in 4 years. ha, Stomp 33% (2.0 l/ha), Samurai 33% (1.5 l/ha) 29.9-30.8 q/ha in herbicide-treated options and 28.2 quintals (q)/ha in without herbicide control options was noted (Table 4).

The effectiveness of herbicides in areas plowed with a two-sided plow can be explained by the fact that cotton yields are higher than in areas plowed with a simple plow.

3.3 Cost-effectiveness of measures taken to control weeds in cotton fields

Zellek Super 10.4% (1.0 l/ha) with annual Samurai 33% herbicide 1.5 l/ha and Samurai 33% (1.5 l/ha) against annual weeds in areas plowed with a two-sided plug the level of net profit and profitability used was found to be high. The cost of 1 quintal of cotton was 79,048.5 UZS/ha in the without herbicide control option plowed on a two-sided plow, Samurai 33% with herbicide 1.5 l/ha 73,641.1 UZS/ha, Samurai 33% (1.5l/ha). When Zellek Super 10.4% (1.0 l/ha) was used consecutively, it was 76,733.1 UZS/ha.

The increase in net profit on arable lands in the two-sided plow was 156,842.7 UZS/ha, the yield was 33.1%. Samurai 33% herbicide was applied at a rate of 1.5 l/ha at a rate of 440,560.6 UZS/ha, yield 45.0%, while Samurai 33% (1.5l/ha) and Zellek Super 10.4% (1.0 l/ha) in the series, 496,102.9 UZS/ha, the highest level of profitability was 46.1%.

4 Conclusions

1. Carrying out a combination of agro-technical and chemical control measures for the effective control of weeds with different biological properties, as well as updating the types of herbicides to increase the effectiveness of chemical control measures against the background of optimal tillage, alternating and sequencing herbicides will need to apply.

2. Plowing on a two-sided plow, relative to the soil plowed on a normal plow, the soil volume mass is 0-10; 10-20; Reduces 0.02-0.03 g/cm^3 in layers of 20-30 and 30-50 cm, increases porosity by 0.7-0.8% and increases the number of annual and perennial weeds by 22.6-28.0; 17.4-20.6%, dry mass 30.0-36.0; Provides a reduction of 19.0-25.4%.

3. Plowing the soil in a two-sided plow and applying Samurai 33% herbicide at a rate of 1.5 l/ha, annual weeds 86.7-90.4%, dry mass 85.8-90.4%, Samurai 33% (1.5 l/ha) with Zellek Super 10.4% (1.0 l/ha) when the herbicide was applied consecutively, and single and perennials 90.0-92.7; 89.9-93.7%, dry mass 89.0-94.0; and provides a reduction of 91.4-93.3%.

4. Samurai 33% at a rate of 1.5 l/ha, compared to the control option 3.1-4.4 q/ha, Samurai 33% (1.5 l/ha) with Zellek Super 10.4% (1.0 l/ha) allows the cultivation of high cotton yields of 4.0-5.4 q/ha when applied in series of herbicides.

5. When plowing the lands with a two-sided plow, Samurai with 33% (1.5 l/ha) and Zellek Super 10.4% (1.0 l/ha) in series with a net profit of 1,076,717.1 UZS/ha, profitability level was 46.

6. Based on the results of scientific research to determine the effectiveness of agrotechnical and chemical control of weeds in cotton fields in the conditions of alluvial soils of meadows of Tashkent province:

- application of annual weed growing in cotton fields with plowing in a two-sided plow (30 cm deep) and planting Samurai 33% herbicide at a rate of 1.5 l/ha;
- Zellek Super 10.4% (1.0 l/ha) with 33% (1.5 l/ha, along with planting) plowing the soil in a two-sided plow (30 cm deep) against single and perennial weeds, when the height of weeds is 10–15 cm) is recommended to apply a series of herbicides.

References

1. S. Isaev, S. Khasanov, Y. Ashirov, A. Gofirov, T. Karabaeva, In E3S Web of Conferences, **244**, 02047 (2021)

2. G. Lin, Z. Liu, Q. Wu, L. Wang, International Journal of Signal Processing, Image Processing and Pattern Recognition, **9**(2), 355-368 (2016)
3. A. Jumanov, S. Khasanov, A. Tabayev, G. Goziev, U. Uzbekov, E. Malikov, In IOP Conference Series: Earth and Environmental Science, **614**(1), 012150 (2020)
4. Z. F. Arslan, Harran Tarım ve Gıda Bilimleri Dergisi, **22**(1), 109-125 (2018)
5. S. K. Isaev, R. U. Rakhmonov, S. S. Tadjiev, G. I. Goziev, S. Z. Khasanov, In IOP Conference Series: Earth and Environmental Science, **614**(1), 012147 (2020)
6. N. Teshaev, B. Mamadaliyev, A. Ibragimov, S. Khasanov, InterCarto. InterGIS, **26**(3), 324-333 (2020)
7. G. M. Mahar, F. Oad, U. Buriro, G. Solangi, Asian Journal of Plant Sciences, **6**(8), 1282-1286 (2007)
8. S. Isaev, S. Khasanov, Y. Ashirov, A. Gofirov, T. Karabaeva, In E3S Web of Conferences, **244**, 02012 (2021)
9. B. S. Nasirov, U. Charshanbiev, I. Dusbaev, Actual Problems of Modern Science, **3**(106), 161-164 (2019)
10. N. Sabitova, O. Ruzikulova, I. Aslanov, In E3S Web of Conferences, **227**, 03003 (2021)
11. Z. Mamatkulov, E. Safarov, R. Oymatov, I. Abdurahmanov, M. Rajapbaev, In E3S Web of Conferences, **227**, 03001 (2021)
12. U. YU. Charshanbiev, K. M. Muminov, International Journal of Science and Research, **6**(10), 1588-1591 (2015)
13. C. Ozaslan, B. Bukun, Soil-Water Journal, **2**(2), 1777-1784 (2013)
14. F. Oad, M. Siddiqui, U. Buriro, Asian Journal of Plant Sciences, **6**(2), 344-348 (2007)
15. B. Sh. Matyakubov, Z. J. Mamatkulov, R. K. Oymatov, U. N. Komilov, G. E. Eshchanova, InterCarto, InterGIS, **26**, 229–239 (2020)
16. I. Musaev, A. Bokiev, M. Botirova, In E3S Web of Conferences, **227**, 05004 (2021)
17. M. Shodmanov, J. Agriculture of Uzbekistan, **6**, 26 (2003) (in Uzbek)
18. M. Shodmanov, Bulletin of Agrarian Sciences of Uzbekistan, **3**(13), 44-46 (2003)
19. N. Ch. Namozov, D. A. Kodirova, M. I. Usmonova, International journal of scientific & technology research, **9**(03), 5491-5493 (2020)
20. U. YU. Charshanbiev, A. Pulatov, J. Agrochemical protection, **4**, 24-26 (2019)
21. U. YU. Charshanbiev, J. Aliyev, J. Agro Ilm, **5**(62), 50-51 (2019) (in Uzbek)