

THE EFFECT OF TILLAGE TECHNOLOGY ON THE AMOUNT OF WEEDS AND THE YIELD OF POTATOES

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Abstract. Weeds deprive agricultural plants of life factors and deteriorate their productivity and quality indicators. Therefore, agricultural experts try to reduce the amount of weeds to minimize the damage caused by it.

First of all, it is important to know their biological characteristics, extent of spread, species composition, which is reflected in the article, in order to carry out the measures against weeds correctly. It is known from the species composition of weeds spread in potato crops that it is possible to eliminate the damage caused by applying the correct soil cultivation technology.

In the research work, when the intermediate plant (field pea + oat mixture) planted under rotation conditions is disked and mixed with the soil and plowed as a result of soil cultivation measures, the reduction of the amount of weeds significantly increases the productivity. Here, the yield increase was 58.5 q/ha or 37.55% compared to the variant that was left fallow after wheat, plowed 25-30 cm and sprayed with herbicide. This suggests that it is possible to significantly increase productivity while minimizing the use of herbicides by applying the correct tillage technology in potato crops.

Keywords: *Tillage technology, potato, weeds, productivity.*

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1. Introduction

One of the most important problems of the modern world is the rapid growth of the world's population. According to FAO (2019) reports, people need 15-20 million tons of food every year. Since the world's cultivated area is limited, new terrains must be created for production to ensure the demand for food or the existing farmland should be used efficiently.

The potato plant has an irreplaceable role in satisfying people's food needs. According to FAO data of 2023, the production area of potato planted in 155 out of 195 countries of the world is 17.34 million hectares. Total production volume was 370 million tons. According to FAO 2020 data, 20.1 tons of potatoes are produced per hectare in the world (Masterov, 2014; <https://www.fao.org/faostat/ru/#data>).

China, India, Russia, Ukraine, USA, Bangladesh, Germany, France, Holland, Poland, etc. are considered to be the countries that produce the most potato production in the world. China, India, Russia, Ukraine and the United States are among the top five countries for potato production. According to statistical data, 55-60% of the total potato

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production in the world is carried out by these countries. Thus, China takes 25%, India 14%, Russia 6%, Ukraine 5.5% and the USA 5% (El-Sayed *et al.*, 2015).

The cultivated area of this plant in Azerbaijan is vary between 69-70 thousand ha. The total production was 1077114 tons, the average yield per hectare was 150-153 centners (Mammadov & Ismayilov, 2012).

Like other crops, potato crops are subject to yield loss due to some diseases, pests and weeds. Calculation of countermeasures to eliminate crop loss is one of the current problems of the day.

According to reports, up to 10-15% of the total volume of agricultural products produced in the world is lost due to the influence of weeds. As a result this increases the cost of product production by 25-30% (Huseynov, 2016; Barchukova, 2004).

Weeds not only compete with crops for nutrients, soil water, space and light, but also serve as a source for a number of pests and diseases. In addition, weeds can also deteriorate the quality characteristics of potato tubers (Caldiz *et al.*, 2016).

Thus, weed control measures play an important role in intensive potato cultivation technology. A successful solution to the problem of weed control is based only on integrated control measures. For integrated control measures, it is important to map weeds in cultivated fields, use agrotechnical methods, as well as select scientifically based selective herbicides (Dolzhenko *et al.*, 2014).

At present, reducing and optimally managing weeds in the areas where cultivated plants are grown is considered to be one of the urgent issues of the day. Different methods should be used in crop fields to properly control weeds. Cultivated plants belonging to the leguminous family have a positive effect on increasing soil fertility by suppressing weeds in crop rotation (Torun, 2017).

In the management of weeds, the soil should be cultivated with a hoe, cultivator, disk trowel, hoe and other such tools. The main purpose of soil cultivation is to improve the physical and chemical properties of the soil. As a result of cultivation, besides enriching the soil quality, weeds are also destroyed. The effectiveness of cultivation depends on the type of weeds, their density and the physical properties of the soil. Plowing should be done deep and timely so that it dries up and destroys the weeds. This method works better on annual weeds.

As for perennial weeds, the roots can be reduced by plowing those on the surface of the crop layer. During deep plowing, their underground organs are removed from the soil and they dry up on the surface of the soil and perish. Otherwise, plant residues left underground after plowing will form new sprouts.

2. Material and method

Taking into account the above mentioned, we considered it appropriate to conduct research in order to prepare measures to combat weeds spread in potato crops in the territory of Ganja-Dashkasan economic region of the republic. The research work was carried out in 2022-2023 at the farm “NB Agriculture and Equestrian LLC” in the territory of Alyushagi village, Samukh region. Our main goal in the research work was to determine the species composition of common weeds in the potato field and to learn how to eliminate the damage caused by different tillage methods.

The Telman variety, which has been regionalized since 2008 in the territory of the republic, has a very high taste and quality and is more suitable for food, was used in the

research work. The Telman variety is medium-growing and the vegetation period is 120-122 days (Khumbatov *et al.*, 2023).

Semi-visual methods are used for recording weeds. The most commonly method was A.I. Maltsev's. Two methods was used for recording weeds in fields - visual and quantitative. By visual method, the fields are carefully inspected, circled along the edges and diagonally and the presence of weeds is determined by eye on a four-point scale: 1 point - weeds are present in single units; 2 points - there are few weeds in crops, but they are no longer rare; 3 points - there are many weeds in the crops, but they do not dominate the cultivated plants quantitatively; Weeds with a score of 4 are quantitatively superior to cultivated plants.

A more accurate calculation of contamination is obtained using the quantitative weight method. At this time, the number of weeds is counted and their mass (fresh and dry) is determined. A frame measuring 50x50 cm (0.25 m²) is placed regularly along the largest diagonal in fields and fields. The framework is applied at 10 points in fields and areas up to 50 hectares, 15 points between 51-100 hectares and 20 points in areas above 100 hectares. The number of weeds of each species within the frame is calculated separately and the result of the calculation is included in the field weed control table (Fetyukhin *et al.*, 2018). The field experiment was randomly placed in 20 lacs with 5 version and 4 repetitions.

Scientific innovation: for the first time, the species composition of weeds in potato crops was determined in the western region of the republic under irrigation conditions and by applying various tillage technologies, their amount was reduced and the potato yield was increased significantly.

3. Results and discussion

Among the weeds in the experimental field are chickweed (*Stellaria media*), green field speedwell (*Veronica agrestis*), buckwheat (*Polygonum convolvulus*), wild radish (*Raphanus raphanistrum*), field buttercup (*Ranunculus arvensis*), earthsmoke (*Fumaria vaffantii*), tulip (*Papaver rhoeas*), wild oat (*Avena fatua*), jointed goatgrass (*Aegilops cylindrica*), darnel ryegrass (*Lolium temulentum*), field mustard (*Sinapis arvensis*), field coriander (*Coriandrum sativum*), white golden window (*Amoranthus albus*), cleavers (*Galium aparune*), baconweed (*Chenopodium album*), green foxtail (*Setaria vridis*), shepherd's purse (*Capsella bursa-pastoris*), shepherd's pillow (*Matricaria inodora*), fall rose (*Vicia villosa*), field carnation (*Agrostemma githago*), small-leaved rose (*Vicia angustifolia*), Corn gromwell (*Buglossoides arvensis*), field brom (*Bromus arvensis*), little lovegrass (*Eragrostis minor*), common dandelion (*Taraxacum vulgare*), field sorrel (*Rumex acetosa*), wintercress (*Barbarea vulgaris*), scutch grass (*Cynodon dactylon*), couch grass (*Agropyron repens*), Johnsongrass (*Sorghum halepense*), creeping thistle (*Cirsium arvense*), perennial sowthistle (*Sonchus arvensis*), field bindweed (*Convolvulus arvensis*) and other weeds are more common (Khankishiyev, 2018).

Various tillage technologies have been applied in order to minimize the use of herbicides as a measure to control these weeds. Good tillage practices are a sustainable approach that considers human health, the environment and the natural balance used to reduce weeds in potato crops.

In order to obtain a high-quality product from potatoes, like other plants, scientifically based technology for cultivation and protection of crops should be

followed. For this, it is necessary to choose a cultivation technology suitable for the soil and climate conditions of the area and take proper integrated control measures against weeds (Tebuev, 2014).

A combination of agrotechnical and biological measures against weeds in agricultural fields has been used for many years. The combination of mechanical, chemical and biological measures in the cultivation technology of potato crops ensures more complete destruction of weeds (Ibrahimov & Allahverdiyev, 2020).

The most important period for weed control in potato crops begins before germination and continues until the closure of the rows. During this period, germination of annual weeds is seen in early spring. It is possible to reduce the amount of weeds by cultivating and filling the fields.

The researchers determined that the economic damage threshold is exceeded when there are 5-12 small annual and 2-4 perennial weeds per 1m² of potato planting. This requires weed control measures. To this extent, it was observed that productivity increased as a result of weed control measures. If there are more than 50 weeds per 1m², potato yield losses are 20-25% of the planned yield (Bazdyrev *et al.*, 2014).

Varietal characteristics play an important role in potato productivity and product formation. Because it depends on the ripening period, direction of use, starch content, resistance to pests and diseases, suitability for product storage and processing. At the same time, weeds affect potato productivity and its quality indicators (Erenkova *et al.*, 2018).

The spread of weeds in potato crops is one of the main problems, reducing the yield and worsening the quality of the product. Researchers report that potato yield can be reduced by 20-25% or more when the amount of weeds in the field exceeds the permissible limit. Weeds absorb moisture and nutrients from the crop layer and as a result, potatoes are unable to obtain sufficient nutrients needed for optimal growth and development. The high prevalence of weeds during the germination stage of potato plants has a negative effect on the formation of the green mass of the plant, which leads to photosynthesis and as a result, large losses in harvest (Naliukhin *et al.*, 2015).

Table 1. The effect of tillage measures in the control weeds on the productivity of the potato plant

No	Version	Yield q/ha	growth	
			q/ha	%
1	The slope is covered, 20-25 cm plowed to keep it as mulch	170,2	14,4	9,24
2	The slope is covered, irrigation, disking, plowing 25-30 cm	174,5	18,7	12,00
3	The slope is covered, disking is done, field peas + oat are planted, after disking, 30 cm plowing is done.	214,3	58,5	37,55
4	The slope is covered, disking is done, field peas + oat are planted and a nest is opened between them.	176,4	20,6	13,22
5	After wheat, it was left fallow, 25-30 cm was plowed and herbicide was used	155,8	-	-

E=8,34 q/ha P=4,68%

In the research work, integrated control measures against weeds in potato crops, consisting of various options, were carried out and the productivity indicators of the plant were studied for each option and repetitions. During the study, results were given on the effect of tillage measures applied against weeds on the productivity of plants grown in rotation and monoculture conditions. Also, integrated measures against weeds were carried out in the cultivation of potatoes, which are alternated after wheat and

cultivated in monoculture and the effect of these measures on productivity and quality indicators of the product was comparatively studied and recorded in the table.

Statistical analysis of experimental data was carried out using methods of dispersion and correlation analysis (Dospekhov, 1985).

As can be seen from the table, after harvesting wheat in the rotation cropping, the yield of the potato plant was 170.2 q/ha in the variant where 20-25 cm of plowing was carried out as a soil cultivation measure and kept as mulch.

In the second option, after harvesting the wheat, the stubble was covered, irrigation, disking and 25-30 cm plowing were used to harvest 174.5 q/ha.

In the third option, after harvesting wheat, the stubble is covered, disking is done, field peas + oat are planted, after disking, when 30 cm of plowing is done, a yield of 214.3 q/ha is obtained. In the crop rotation, an intermediate crop (field pea + oat) was planted after wheat, which led to a decrease in the number of weeds and an increase in productivity compared to other options.

In the fourth option, after harvesting wheat, which is the main crop, the stubble is covered, disking is carried out, field peas + oat are planted and when potatoes are planted, a crop of 176.4 s/ha is harvested.

In the fifth variant, after the wheat was left fallow, 25-30 cm of plowing was carried out and herbicide was sprayed and after that, when potatoes were planted under monoculture conditions, a yield of 155.8 q/ha was collected.

4. Conclusion

At the end of the research, we come to the conclusion that the reduction of the amount of weeds significantly increases the yield when the intermediate plant planted in the conditions of rotation (field pea + oat mixture) is disced and mixed into the soil and plowed as soil cultivation measures. Here, the yield increase was 58.5 q/ha or 37.55% compared to the version that was left fallow after wheat, plowed 25-30 cm and sprayed with herbicide. This suggests that it is possible to significantly increase productivity while minimizing the use of herbicides by applying the correct tillage technology in potato crops.

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