



RESEARCH ARTICLE

INFLUENCE OF VARIOUS GREEN MANURE CROPS ON WATER-PHYSICAL, PHYSICAL, FERTILE SOIL PROPERTIES, YIELD AND SEED QUALITY OF POTATO VARIETIES

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ABSTRACT

The conditions of old-irrigated typical sierozem soils of the Kashkadarya region, when studying the sowing of rapeseed, oil radish, barley, peas and blue mustard in pure form, as well as a mixture of peas+oil radish as green manure crops in summer and autumn, the yield of biomass per hectare was 19,3-30.2 tons, in the spring 22.1-35.1 tons. The highest yield (30.7-39.6 or 7.2-11.4 t/ha additionally), of which marketable yield 29.8-39.1 t/ha, seed tubers yield 21.2-29.2 t/ha, the multiplication factor within 6.4-8.8 for medium early potato varieties Kondor, Arizona, Saviola and Bardoshli-3 was recorded using peas, gray mustard and a mixture of peas+oil radish as winter green manure crops. Plant development (the growing season lengthened to 2-10 days, 67.2-83.6 cm high; multi-stem 4.2-5.7 or more 1.1-1.8 pcs; powerful tops 404.4-495.3 d), the formation of productive, healthy (yield of tubers 617.5-998.8 g, number of tubers - 6.7-11.2, average weight of one tuber - 76.2-93.1 grams) bushes and crops, yield (30.7-39.6 t/ha, including marketable yield 29.8-39.1 t/ha, yield of seed tubers 21.2-29.2 t/ha, multiplication factor within 6.4-8,6) with high seed qualities of various varieties of potatoes.

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INTRODUCTION

In the context of global growth of the world population, growing demand for food, climate change, food security in order to increase soil fertility, protect and improve soil structure, control weeds and pests, to achieve this and increase yields and product quality in the crop rotation system in biological methods, much attention is paid to the use of green manure crops (as the main, cover, intermediate and forage crops). Therefore, it is imperative to conduct research for various soil and climatic conditions to identify suitable types of green manure crops with allelopathic inhibitors, to establish the timing of cultivation in order to achieve a high yield of biomass and seeds, increase soil fertility, potato yield, and improve seed quality of tubers. This, in turn, is associated with the constant development and improvement of the applied agricultural technology in terms of varieties (genotypes). The influence of green manure crops on soil fertility of crops, growth, development, infection of plants with weeds, diseases and productivity of cotton, grain and other crops [1,2,3,4], and in potato growing [5,6,7,8] were studied.

The purpose of the study: Is to study the formation of plants, biomass of green manure crops and growing them for seeds in

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potato growing, when using green manure crops in green manure, determine the growth, development, yield formation, yield and seed quality, and also scientifically substantiate soil fertility and, on the basis of the creation of this technology. cultivation, providing the possibility of obtaining a stable high healthy seed yield by isolating promising green manure crops and potato varieties in the conditions of old-irrigated typical sierozem soils of the Kashkadarya region of Yakkabog district.

MATERIALS AND METHODS

The object of the research was old irrigated typical sierozem soils, autumn rapeseed - varieties Nemerchansky-2268; oil radish - Raduga; barley - varieties Temur; peas (green peas) - varieties Vostok-55; gray mustard - varieties Yubileynaya, the early ripening potato varieties Kuvonch-1656m, medium-ripening varieties Bahro-30, Bardoshli-3, Sante, Kondor, Arizona and Saviola. In 2016-2020, studies were carried out on old-irrigated medium loamy typical sierozem soils with groundwater occurrence of 6-8 m. The soils were characterized by favorable agrophysical properties and a low content of humus, nitrate nitrogen, mobile phosphorus, and an average content of exchangeable potassium. It was determined that the experimental field is composed of old-irrigated typical sierozem, groundwater is at a depth of 6-8 meters, the mechanical composition is medium clayey, the humus content (0-30 cm) is 0.093-1.15%, the bulk density of the soil is 1.27-1.31 g/cm³, specific gravity - 2.6-2.9 g/cm³, in the arable layer

0-30 cm gross nitrogen is 0.057-0.093%, total phosphorus 0.144-0.163%, potassium - 2.6-2.9%, nitrogen in the form of nitrate - 5.14-6.51 mg/kg, mobile phosphorus - 17-27 mg/kg, exchangeable potassium - 287-307 mg/kg. According to the data presented, it was revealed that the amount of nutrients in the subsoil is slightly less. The yield of potato varieties was calculated, the yield of marketable and seed yields and the multiplication factor, the quality of seed tubers according to experimental options (according to the infection of the plant with viral diseases and the yield of degenerate tubers, as well as the yield of subsequent reproduction) were determined. Yield indicators were statistically processed according to the method of B.A. Dospekhov (1985), dispersion and correlation analyzes were carried out. Statistical processing of the received data was carried out by means of program Microsoft Excel and SPSS (Statistical Package for Social Science).

For these potato varieties, the following green manure crops were studied:

I-variants of summer green manure (winter green manure): 1. Control (winter plowing); 2. Rape - variety Nemerchansky-2268; 3. Oil radish - grade Rainbow; 4. Barley - Timur variety; 5. Peas (green peas) - grade Vostok-55; 6. Graymustard - grade Jubilee; 7. Peas+oilradish. II-variants of winter green manure (spring green manure): 1. Winter plowing (control); 2. Springplowing; 3. Rape - variety Nemerchansky-2268; 4. Oil radish - grade Rainbow; 5. Barley - Timur variety; 6. Peas (green peas) - grade Vostok-55; 7. Graymustard - grade Jubilee; 8. Peas+oilradish.

The area of the plot for green manure is 224 m², and for varieties it is 14 m², the experiment was repeated three to four times. Sowing of green manure crops was carried out in 2 terms: in the summer of July 26-28, in the fall of October 14-19, seeding rates: rapeseed - 16.0; barley - 160; peas - 70; mustard gray - 14.0; oil radish - 20.0 kg/ha, and with the combined sowing of crops, the rate was taken in half. Fertilizers were applied at the rate of N30P100K60 kg/ha. After sowing, summer green manures were watered 9 times at a rate of 450-500 m³/ha, and winter green manures were watered 2 times in autumn and spring. In winter green manure crops, 10-12 days before planting potatoes, and in summer green manure crops in late autumn, the yield was determined during the period of mass flowering or heading, then with the help of the KIR-1.5 unit, they were crushed, discarded and plowed to a depth of 28-30 cm. Research results. Autumn green manure crops rape, gray mustard, oil radish spent a period of winter dormancy in the phase of tops formation, peas - in the germination phase, barley - in the tillering phase, plant density per 1 m² of winter green manure crops was 473.0 in rape, oil radish - 481.2, barley - 356.0, peas - 198.7, gray mustard - 477.7, peas+oil radish - 489.8 pcs.; plant height - 115.0 cm for rapeseed, oil radish - 122.5 cm, barley - 87.7 cm, peas - 207.6 cm, gray mustard - 219.6 cm, peas + oil radish - 215.3 cm. The distribution of the root system of summer and autumn green manures in soil layers varied depending on the type of green manure: rape root and blue mustard - at a depth of 1.0-1.5 m, oil radish root crop - 0-20 cm, main root 0.8-1.2 m, barley roots - 0.8-1.2 m, pea roots - 0.9-1.2 m. The biomass yield of summer green manure crops was 19.3-30.2 t/ha. The highest biomass yield (29.3-30.2 t/ha) was obtained when sowing a mixture of oil radish and peas+oil radish for green manure. The biomass yield of winter green manure crops was 22.1-35.1 t/ha for green manure types.

The highest (35.1 t/ha) biomass yield was observed when sowing oil radish as green manure. A relatively high yield of biomass (29.6-32.3 t/ha) was obtained by mixing peas+oil radish and blue mustard in its pure form (Table 1). When using the biomass of summer green manure, the share of macroaggregates larger than 0.25 mm increased (compared to autumn plowing) in the arable layer of 0-10 cm - by 3.0-7.3%, in the arable layer of 10-30 cm - 3, 8-9.8%. The largest (17.7-21.6%) share of macroaggregates relative to the control variant (>0.25 mm) was observed when sowing peas+oil radish. When sown in autumn as green manure crops, the mixture of peas+oil radish >0.25 mm (0-30 cm) was 19.8-25.9%, or 8.2-13.0% higher than the control variant. When sowing peas, gray mustard in its pure form amounted to 18.3-25.3%, which is more than the control by 6.7-12.4%.

At various times before sowing the seeds of green manure crops in the soil and after the introduction of biomass of green manure crops into the soil according to potato varieties during the growth period before the first and last watering, changes in the bulk soil mass in the arable layer were studied. Potato cultivars studied after the introduction of green manure of the biomass of agricultural crops as a green manure in late autumn during the growing season before the first irrigation in typical gray soils showed an increase in the bulk soil mass of 1.25-1.26 and 1.29-1.31 g/cm³ in layer 0-20 and 20-30 cm. After various autumn green manure crops were also studied in medium early potato varieties Sante, Kondor, Arizona, Saviola and Bardoshli-3, in which it was observed that during the growing season of potato varieties before the first watering when sowing peas+oil radish as a siderate was provided in the arable layer (0-20 and 20-30 cm) with a bulk density of 1.23 and 1.27 g/cm³, or its decrease in comparison with the control (autumn plowing) by 0.05 and 0.07 g/cm³. When sowing peas and gray mustard in pure form as a green manure before the first watering, in potato varieties during the period of growth in the arable layer (0-20 and 20-30 cm), a volumetric mass of 1.24 and 1.28 g/cm³ was revealed, which shows a decrease in comparison with autumn plowing by 0.04 and 0.06 g/cm³.

When used as green manure peas+oil radish before the last irrigation during the period of growth in the arable layer, the bulk density was 1.24 and 1.28 g/cm³, which provided the greatest decrease by 0.06 and 0.07 g/cm³ in comparison with control. In the autumn, when sowing peas and gray mustard as green manure in pure form according to potato varieties before the last irrigation in the arable layer, a decrease in volumetric mass of 1.25 and 1.29 or 0.05 and 0.06 g/cm³ ha was revealed. No parasitic plants were found among green manure crops and potato crops. It is noted that they have an allelopathic effect on reducing the germination of weed seeds in the upper soil layer when sown as green manures of rapeseed, oil radish, barley, peas, gray mustard in pure form and peas+oil radish in mixed form. In the summer and autumn periods, a mixture of peas+oil radish, gray mustard and peas (green peas) as green manure provided the highest humus content (1.17-1.22 or 0.02-0.03%) when sown in its pure form. The C:N ratio was favorable when the green manure crops were sown with mixed crops and the humification of the crop was increased. The highest concentration of N-NO₃ (12.38-33.56 mg/kg) was observed when sowing peas as green manure, relatively high when sowing peas+oil radish - (12.35-31.54 mg/kg). The greatest accumulation of mobile phosphorus in the soil (31.37-43.25

Table 1. Growth, development and productivity of green manure crops

№	Types of siderate crops	Summer siderate				Winter siderate			
		Plants per 1 m ² , pes.	Plant height, sm	Yield, t/ha		Plants per 1 m ² , pes.	Plant height, sm	Yield, t/ha	
				Green weight	Dry weight			Green weight	сухая масса
Tremens of plowing biomass in the soil									
24-25. X. 2016-2018.					02-05. IV. 2017-2019.				
1	Rapeseed	556,2	83,2	22,6	4,5	473,0	115,0	28,1	5,6
2	Oilseed radish	467,3	99,7	30,2	6,0	481,2	122,5	35,1	7,0
3	Barley	479,1	71,6	19,3	3,8	356,0	87,7	22,1	4,4
4	Peas	103,4	98,6	23,6	4,7	198,7	207,6	27,1	5,4
5	Grey mustard	414,0	108,3	25,9	5,2	477,7	219,6	29,6	5,9
6	Peas+oilseed radish	463,0	102,3	29,3	5,8	489,8	215,3	32,3	6,5
	$S_x = (\%)$	2,07 - 3,06				1,06 - 1,35			
	NSR _{0,5} (t/ha)=	0,51 -0,77				0,31 - 0,41			

Table 2. The yield of the selected potato varieties after the application of the biomass of autumn green manure crops

№	Name of green manure crops	Yield by years, t/ha			Average yield, t/ha	Compared to control	
		2017	2018	2019		t/ha	%
The variety Arizona							
1	Control (autumn plowing)	30,1	25,8	28,9	28,2	-	100,0
2	Spring plowing	27,9	24,4	25,6	25,9	-2,3	91,8
3	Rape	33,7	33,8	34,5	34,0	5,8	120,5
4	Oil radish	33,0	33,2	34,1	33,4	5,2	118,4
5	Barley	32,1	32,3	33,0	32,4	4,2	114,9
6	Peas	37,9	39,7	41,4	39,6	11,4	140,4
7	Gray mustard	36,8	38,5	39,1	38,1	9,9	135,1
8	Peas+oil radish	37,2	39,0	40,1	38,7	10,5	137,2
	$S_x = (\%)$	2,43	2,13	2,24			
	HCP _{0,5} = (t/ha)	0,82	0,70	0,77			
The variety Saviola							
1	Control (autumn plowing)	30,1	25,6	28,7	28,1	-	100,0
2	Spring plowing	27,8	24,3	25,5	25,8	-2,3	91,8
3	Rape	33,4	33,9	34,3	33,8	5,7	120,2
4	Oil radish	32,9	33,6	34,0	33,5	5,4	119,2
5	Barley	31,7	32,5	32,9	32,3	4,2	114,9
6	Peas	35,4	37,5	39,2	37,3	9,2	132,7
7	Gray mustard	34,6	36,5	37,0	36,0	7,9	128,1
8	Peas+oil radish	35,0	37,2	37,7	36,6	8,5	130,2
	$S_x = (\%)$	2,18	2,57	2,87			
	HCP _{0,5} = (t/ra)	0,72	0,85	0,97			
The variety Bardoshli-3							
1	Control (autumn plowing)	30,0	25,3	28,6	27,9	-	100,0
2	Spring plowing	27,6	24,1	25,4	25,7	-2,2	92,1
3	Rape	31,5	31,9	32,8	32,0	4,1	114,7
4	Oil radish	30,8	31,5	32,3	31,5	3,6	112,9
5	Barley	30,4	30,8	31,2	30,8	2,9	110,4
6	Peas	34,4	35,5	36,6	35,5	7,6	127,2
7	Gray mustard	32,3	33,8	34,7	33,6	5,7	120,4
8	Peas+oil radish	32,5	34,9	35,3	34,2	6,3	122,6
	$S_x = (\%)$	2,69	3,47	4,35			
	HCP _{0,5} = (t/ra)	0,83	1,08	1,40			

mg/kg) was observed in the summer and autumn periods, when rapeseed and gray mustard were sown in pure form, peas+oil mustard. Autumn green manure significantly changed the amount of available phosphorus. An increase in N-NO₃ under the action of green manure increases the amount of available phosphorus. The amount of exchangeable potassium was brought to the maximum amount (310.7-326.2 mg/kg) when sowing rapeseed, gray mustard and peas+oil radish as siderates. Studies have shown that the germination of potato varieties studied on summer varieties of green manure was observed 11-20 days after planting, and the field germination of tubers was 97.5-99.8%.

Compared to the control variants of green manure, the field germination of seed tubers by varieties is higher by 2.2-2.7%, seedlings are observed on days 2-7, budding 2-3 days, flowering 1-5 days earlier, the growing season lengthened by 3-10 days. The highest field germination (98.8-99.9%) of the studied potato varieties, the emergence of seedlings (up to 6 days), budding and flowering (more than 2-5 days) and the duration of the growing season (more than 7-10 days) was observed when used in as a siderat of peas, when sowing peas + oil radish and gray mustard in pure form, field germination is 2.7-3.2% higher compared to control, seedlings appear 2-6 days earlier, budding and flowering - 3-4, the growing season



When using green manure crops for potato varieties (experimental field)



Rape Gray mustard Gray mustard Oil radish

is extended to 6-8 days. The growth, development and formation of vegetative organs (stems, leaves and side shoots) of the studied early-ripening potato varieties Kuvonch-1656m, medium-ripening varieties Sante, Kondor, Bakhro-30, Arizona and Bardoshli-3 increased in 30 days in comparison with the summer control variants of green manure crops. In height 32.6-44.0 or 1.9-10.6 cm, this indicator in the next 40-70 days of the growing season was noted that the height of plants reached 4.2-17.0 cm every ten days. When sown as a green manure of pure peas, the maximum plant height on the 30th day of the growing season was 5.4-10.6 cm compared to the control option, and the plant height in the next 40-70 days of the growing season was determined that the height of plants in on average, they reached 10.1-17.0 cm every ten days.

When sowing peas+oil radish and mustard with glaucous in pure form, the height of plants on potato varieties is 34.6-43.8 or 3.9-10.4 cm more on the 30th day of growing season compared to control (autumn plowing), in the next 40-70th days of the growing season, it was noted that the height of the plants reached an average of 7.5-14.3 cm every ten days. When studying potatoes of the early-ripening variety Kuvonch-1656 m and the mid-ripening varieties Bakhro-30, Sante and Kondor, plants with the widest leaf surface were recorded when sowing peas as green manure in the summer, the leaf surface was 69.1-70.8 thousand m² per hectare or in comparison with the control (autumn plowing) option 19.4-20.1 thousand m² with a wide leaf surface, a relatively high leaf surface was observed when sowing gray mustard in pure form and a mixture of peas+oil radish, which, in comparison with the control option (autumn plowing), provided 18.6-19.4 ming m² more leaf area. This pattern was also observed in the study of summer green manure varieties of potato varieties Arizona and Bardoshli-3, according to varieties, this provided 67.4-70.8 thousand m² of a wide leaf area per hectare or in comparison with the control variant (autumn plowing) by 17.7-20.9 thousand m² more leaf area per hectare.

After the application of summer green manures of early-maturing potatoes of the Kuvonch-1656 m variety, of the mid-ripening varieties Bahro-30, Sante and Kondor in the green manure variants, the average yield was 23.5-30.9 tons per hectare, or more than the control variant (autumn plowing) by 5.0-42.4 percent. The highest potato yields of the studied mid-season varieties Arizona and Bardoshli-3 were observed in summer green manures; when peas were used as green manure crops, a yield of 33.8-36.7 per hectare was achieved or relative to the control variant (autumn plowing) an additional yield of 6.7-9.0 tons or more by 24.7-32.5%. After using peas as green manure, the tested potato varieties Sante, Kondor, Kuvonch-1656 m and Bakhro-30 achieved the highest markeTable (29.5-32.3 t/ha), seed (21.3-23.4 t/ha) yield and coefficient of increase (6.4-7.1). At the same time, the degenerate tubers amounted to 0.74-0.84 tons, or 2.5-3.7%, or 0.29-0.23 tons, or 2.6-1.5% less than the control (autumn plowing). These indicators of summer green manures were higher when studying potatoes of early varieties Arizona and Bardoshli-3. When used as green manure crops, peas in comparison with the control option (autumn plowing) by varieties ensured the highest marke Table yield of 33.3-36.2 t/ha or more by 98.6%, seed yield 24.7-27.0 t/ha or more by 74.3-74.6%, and the increase rate is higher by 7.5-8.2%.

When studying winter green manures in potato varieties Sante and Kondor, in comparison with the control, the highest indicators were revealed when sowing peas as green manures - field germination of seed tubers is 3.4-3.5% higher, seedlings are earlier by 4 days, budding and flowering - 3-5 days, the duration of the growing season is 7-8 days longer. It was determined that, when using a mixture of peas + oil radish and mustard in pure form as green manure, that a relatively high field germination of seed tubers (99.6-99.8 or 3.4-3.5%), seedlings (15 or 4 days earlier), budding (34 or 4 days long) and flowering (17-18 or 3-4 days long), the length of the growing season (87-89 or 7 days long). This pattern was also observed in potato varieties Arizona, Saviola and Bardoshli-3 tested on winter green manure. Studies of potatoes of medium early varieties Sante, Kondor, Arizona, Saviola and Bardoshli-3, studied in winter green manures, showed that the growth, development and formation of growth organs (stems, leaves and side shoots) on the 30th day of cultivation amounted to 37.6-46.5 or higher 2.9-7.6 cm, the growing season for 40-70 days ranged from 48.5 to 83.6 or higher from 2.6 to 16.4 cm. The tallest plants in winter green manure were noted in varieties Arizona, Saviola and Bardoshli-3. The leaf surface area per hectare was 70.6-71.6 thousand m² for the medium-early varieties of potatoes Sante and Kondor in the fall when sowing peas as green manure.

It is noted that when peas are used in the form of green manure, the leaf surface area is 21.3-21.8 thousand m²/ha higher than the control. The potatoes studied on winter crops of green manure were found to have the highest leaf surface area on the 40-70th days of vegetation of plants of medium early potato varieties Arizona, Saviola and Bardoshli-3. When using the biomass of winter green manures, the leaf surface area by varieties was 67.8-72.1 thousand m²/ha, which is 17.5-21.3 thousand m²/ha more than the control. It was determined that the most in the leaf area (71.5-72.1 thousand m²/ha) when sowing peas in their pure form as green manure. When sowing a mixture of peas+oil radish and blue mustard in its pure form, the leaf surface area was 70.0-71.8 per hectare, or 19.7-21.0 thousand m²/ha more than the control.

It was noted that the yield of medium early potato varieties Sante and Kondor, studied in winter green manures, was the highest when using peas as green manure, and the yield was 32.3-35.8 tons per hectare or an additional yield of 8.8-11.5 tons. Relatively high yields of 30.7-32.8 t/ha were obtained by sowing a mixture of peas+oil radish and blue mustard in its pure form as green manure and an increase in yield was obtained by 7.2-8.5 t/ha more than in the control (autumn plowing). The highest yield (35.5-39.6 t/ha) of mid-early potatoes varieties Arizona, Saviola and Bardoshli-3 was recorded when sowing peas as green manure with an additional yield of 7.6-11.4 t/ha or 127.2-140.4%. A relatively high yield (33.6-38.7 t/ha) was obtained when sowing a mixture of peas+oil radish and gray mustard as green manure. In the studied potato varieties Sante and Kondor, after winter green manure, the marke Table yield per hectare was 23.4-35.3 t or 93.2-98.6%, of which 15.5-25.7 t/ha or 66.3-72.8% seed. The total yield of potato varieties Arizona, Saviola and Bardoshli-3, studied on winter green manure, was 29.1-39.1 t or 94.5-98.9% of the marke Table yield, 19.6-29.2 t/ha or 67.6-74.8% of the marke Table yield was seed, and the multiplication factor was 5.9-8.8.

When studying peas as winter green manure varieties, the marketable yield was 38.0-39.1 per hectare; the yield of seed tubers is 28.3-29.2 tons, and the multiplication factor is 8.6-8.8% (Table 2). When using winter green manure crops, potato varieties showed a positive correlation between the yield and leaf area $r = 0.797$ ($R^2 = 0.6347$), between the yield and the average weight of one tuber per bush - a high degree $r = 0.877$ ($R^2 = 0.7689$), between marketable and seed yields - a high degree $r = 0.995$ ($R^2 = 0.9910$). When using the biomass of winter green manure crops for green manure, the highest field germination of tubers of medium early potato varieties Sante and Kondor was found to be 97.4-98.0% or 6.2-6.4% higher than the control variant (autumn plowing), the germination rate (16 or 3-4 days earlier), lengthening the growing season (86-87 or 6-7 days), tall (70.1-74.6 or 12.3-15.1 cm higher) and multi-stem plants (4.3 -5.5 or more 1.0-2.0 pcs.), Which was obtained when planting potato tubers in conditions of sowing peas as green manure. The smallest infection with viral diseases was observed when sowing seeds grown under conditions of using blue mustard, rapeseed in its pure form and a mixture of peas+oil radish as green manure, compared with the control (autumn plowing) by varieties decreased by 11.4-11.0% obvious, by 27.6-27.0 (including viruses X-7.8-7.1; S-12.2-11.8; Y-7.0-6.7; M-1.0-0.9) percent of the latent form of morbidity. When planting seed tubers of medium early potato varieties Arizona, Saviola and Bardoshli-3 grown after winter green manure crops, on the 20th day after planting, field germination of tubers by varieties was 95.7-98.6% or 4.0-6, 4% higher compared to control, seedlings appear 4-5 days earlier, the growing season lengthened by 4-7 days, plant height is above 6.5-15.6 cm, the number of stems in the bush is more than 0.6-1.2 pcs., the viral incidence of plants and tubers: the explicit form decreased by 8.6-11.4%, and the latent 17.4-27.4% (of which viruses X-3.5-7.9; S-9, 8-12.1; U-3.6-7.1; M-0.5-1.0). Potatoes grown under pea conditions as green manure crops have the highest field germination (98.6 or 6.4-6.9%) when sowing seed tubers of Arizona, Saviola and Bardoshli-3 varieties, seedlings appear 4-5 days earlier, the vegetation of plants is increased by 7 days, the height of plants is 75.3-78.1 or higher by 15.0-15.6 cm, there are 4.4-4.6 or 1.2 more stems in the bush, the infection of plants and tubers by viruses: a decrease in the apparent form by 8.5-8.7, hidden by 26.3-26.4% (of which viruses X-6.5-6.6; S-11.2; Y-8.0; M- 0.6). The lowest incidence of viral diseases (explicitly: 7.6-8.0 or 11.1-11.3% less; hidden: 23.3-24.1 or 27.1-27.8% less, of which viruses: X-5.3-6.0; S-10.7-11.1; Y-6.4-6.9; M-0.5-0.6%) was observed after green manure cultures - rapeseed, gray mustard and a mixture of peas+oil radish. The same pattern was observed when sowing seed tubers of potato varieties Arizona, Saviolava Bardoshli-3 after winter green manure crops. When planting a reproduction of seed tubers grown after winter green manure, in comparison with the control (autumn plowing), the marketable yield of the Arizona variety increased by 2.1-8.5 tons or 6.8-9.8% per hectare, the percentage of degenerate tubers decreased by 2, 3-3.8%. The highest marketable yield (29.1-31.1 t/ha) and a relatively low proportion of degenerate tubers (2.0%) were observed when planting seed tubers after peas. A relatively high yield (26.9-29.7 t/ha) and the minimum share of degenerate (1.6-2.0%) tubers by varieties were recorded when planting seeds grown after blue mustard in pure form and a mixture of peas+oil radish as green manure crops.

Net profit per hectare from the use of summer green manure crops is 17.1-36.3 million soums for varieties, 17.7-38.0 million soums when using winter green manures. The level of profitability for potato varieties amounted to 63.0-111.8% when using summer green manure crops, 67.3-114.4% when using winter green manures or as a result of using summer green manures, the profitability of the industry increased by 5.5-39.1%, and with autumn green manure crops by 4.3-41.0%.

Conclusion

- Under the conditions of old-irrigated typical sierozem soils of the Kashkadarya region, when studying the sowing of rapeseed, oil radish, barley, peas and blue mustard in a pure form, as well as a mixture of peas+oil radish as green manure crops in summer and autumn periods, the biomass yield per hectare was in autumn 19.3-30.2 tons, in spring 22.1-35.1 tons. The highest yield of biomass in both periods was obtained under the conditions of sowing oil radish in its pure form and a mixture of peas+oilradish. The biomass yield of winter green manures was 3.7-4.9 t/ha higher than summer green manures.
- After the application of the biomass of green manure crops as green fertilizers, the mechanical, physical, water properties, microbiological characteristics and soil fertility improved, especially when peas, gray mustard, pure rapeseed and a mixture of peas + oil radish were introduced in the arable layer in the autumn period. compared with the control option, there was an increase in the share of macro-aggregates by 13.4-25.9%, a decrease in micro-aggregates by 24.7-27.6%, water permeability increased by 71.0-124.7 m³/ha or more by 15.1-26.17%, decrease in bulk density by 0.01-0.07 g/cm³, the degree of weed infestation did not exceed 7.4-17.5% or 1 and 2 points, the number of earthworms per 1 m² of the arable layer increased 3.1-6.3 times, as a result of which the humus content was up to 1.17-1.22 or more 0.02-0.03%, gross nitrogen, phosphorus and potassium, especially nitrate nitrogen up to 12.38-33.56, and mobile phosphorus 31.37-43.25 and exchangeable potassium 311.4-326,2 mg/kg soil.
- By the correct selection of summer siderates and medium early potato varieties, it has been shown that it is possible to increase the yield by 29-36 tons per hectare, including the yield of seed tubers by 20-27 tons with a multiplication factor of 6.0-8.0. When planting the reproduction of seed tubers of these potato varieties, the highest yield was obtained (21.5-27.7 t/ha), the proportion of degenerate tubers decreased to 3.3-3.5%, a healthy ecologically clean harvest was obtained.
- The highest yield (30.7-39.6 or 7.2-11.4 t/ha additionally), of which the marketable yield is 29.8-39.1 t/ha, the yield of seed tubers is 21.2-29,2 t/ha, the multiplication factor in the range of 6.4-8.8 for medium-early potato varieties Kondor, Arizona, Saviola and Bardoshli-3 was recorded using peas, gray mustard and a mixture of peas + oil radish as winter green manure crops.
- When using gray mustard, peas and a mixture of peas+oil radish as green manure crops in summer and autumn, medium early potato varieties provide the greatest additional net profit of 5.9-15.9 million soums per hectare and a profitability level of 16.4-32,2%.

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