



Biomass And Seed Yield Of Autumn Siderate Crops, Importance Of Siderate In Potato Farming

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CC License CC-BY-NC-SA 4.0	<p style="text-align: center;">Abstract</p> <p>The article studied, in the conditions of old-irrigated typical sierozem soils of the Yakkabog district in the Kashkadarya region, agrochemical, agrophysical and soil fertility, growth, development, crop formation, yield and seed qualities of potato varieties after different green manure crops.</p> <p>Key words: summer and winter green manure crops, biomass, growth and development, growing season, potato varieties, leaf surface area, marketable and seed crops of potato varieties, reproduction coefficient.</p>
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INTRODUCTION

“Potato growing is the leading industry in world agriculture, the sown area of this crop is 17.6 million hectares, while the gross harvest is 368.2 million tons, the average yield is 20.9 t/ha. The developed countries in potato growing are China (96.1 million tons), India (45.4 million tons), Russia (35.1 million tons), Ukraine (23.7 million tons), USA (20.05 million tons), Germany (11.8 million tons), Bangladesh (9.45 million tons), Poland (8.2 million tons), France (8.02 million tons). tons), the Netherlands (7.1 million tons). In 11 countries of the world (Kuwait, the Netherlands, Belgium, New Zealand, Great Britain, Denmark, USA, Germany, France, Ireland, Switzerland), the potato yield was 40.3-67.5 tons or more. And the lowest was obtained in Cameroon (3.0 t/ha), Niger (3.5 t/ha), Congo (4.6 t/ha) and Bolivia (5.5 t/ha). In world agriculture, the use of biomass of green manure crops as green manure improves soil fertility, increases the yield and quality of potato seeds.

Due to the increase in the demand for food products in the world, which ensures food security, improves soil fertility properties, and increases the yield and quality of agricultural crops, the use of siderate crops (main, cover, intermediate crops, fodder) in the rotation system of different soil-climates determining the type of siderate crops suitable for the conditions, achieving high biomass and seed yield, and using it as a green fertilizer require regular improvement of agrotechnics. Therefore, it is one of the urgent tasks to

conduct research in the priority areas such as planting dates of siderate crops, soil fertility and potato productivity by using green mass as siderate, and using siderate crops to improve and increase seed quality [1,2,4,5,6,7,8,9, 11,12,13,14,15,16,17].

Currently, the amount of potatoes grown in the republic, including the developing potato growing region of Kashkadarya, cannot meet the demand of the population. Taking this into account, the government of the Republic has entrusted scientists with the task of developing research on the creation of fruitful, disease-resistant, high-tasting and storable potato varieties, suitable for local conditions and modern technology, as well as the traditional selection method in the organization of seed production, free of viruses based on the gradually accelerated technological method. there are enormous tasks such as growing seeds, fully supplying the population with potato products, and exporting abroad [1,2].

The use of various siderate crops as green manure is of great importance in maintaining, improving and increasing the natural fertility of the soil in the short rotation rotation used in growing potatoes. , positively changes the mechanical, water-physical, agrophysical, agrochemical and microbiological properties of the soil.

Aim of the research. Growth, development, biomass yield of different siderate crops planted in the autumn period in the conditions of long-irrigated typical gray soils of Yakkabog District, Kashkadarya region, time of planting siderate crops for seed and seed yield, growth, development, harvest, yield and seed yield of different potato varieties when biomass is used as sideration researching the effect on the quality and fertility of the soil, scientific justification of the cultivation technology to allow obtaining a healthy and clean harvest of high-quality seeds.

Materials and methods. Information is provided on the field and production experiments conducted in 2020-2022 in the conditions of old-irrigated typical gray soils of the Kashkadarya region.

The soil of the experimental field is old-irrigated typical gray soils, groundwater is at a depth of 5-7 meters, the mechanical composition is medium

clayey, the humus content (0-30 cm) is 0.098-1.21%, the volumetric mass of the soil is 1.28-1.32 g/cm³, specific gravity - 2.6-2.7 g/cm³, in the arable layer 0-30 cm, gross nitrogen is 0.095-0.094%, total phosphorus - 0.147-0.166%, potassium - 2.7-3.0 %, nitrogen in the form of nitrate - 6.17-6.64 mg /kg, mobile phosphorus - 18-29 mg/kg, exchangeable potassium - 289-312 mg/kg. According to the data presented, it was revealed that the amount of nutrients in the subsoil layer is slightly less.

Conducting field experiments, planting, crop care, harvest and calculation, all observations, measurements and analyzes were generally accepted by the Ministry of Agriculture (QXV; 2016), All-Russian Institute of Plant Science (VIR: 1984; 1986), All-Russian Scientific Research Institute of Potato Farming (NIIKX: 1967; 1989), the Scientific Research Institute of Vegetables, Rice Crops and Potatoes of Uzbekistan (NIIOBKiK: 2002), the State Variety Testing Commission (1974) etc. During the research, the following calculations, observations and analyzes were carried out in the experimental field:

The agrochemical description of the experimental field was determined: humus in the soil tillage layer (0-30 cm) by the method of I.V. Tyurin; gross nitrogen, phosphorus, potassium by the method of I.M. Maltseva and L.P. Gritsenko; nitrate nitrogen by Granwald-Lyaju method; ammonium nitrogen by the Nessler method; mechanical composition of the soil by the method of N.A. Kachinsky; mobile phosphorus by the method of V.P. Machigin; exchangeable potassium by the method of P.V. Protasov; soil water permeability S.I. Dolgov and S.N. It was determined by the Ryjov method.

Soil moisture is thermostatic; actual bush thickness was calculated 2 times (before germination and harvest).

Phenological observation was carried out according to the method of the State Variety Testing Commission (1974); biometric measurements (plant height, stem, number of lateral branches, number of leaves and level) were carried out according to the method of the Scientific Research Institute of Potato Farming (NIIKX; 1967; 1989); damage to plants and tubers by viruses was determined using visual and serological and immunoenzyme analyzes (Metodicheskie ukazaniya po serologicheskoy diagnostike virusov i bakterii, porajayushchie kartofel, Moscow, 1972); average productivity indicators of each plant (palm weight per plant, mass of nodules and roots, number of nodules, average weight of nodules per plant) by selecting 20

plants from each delyanka in different varieties and experimental options All-Russian Scientific Research Institute of Potato Farming (NIIKX; 1967; 1989)) was studied according to the style; 60, 70 and 80 days after the plants of the varieties germinated, the yield was determined by the digging method; productivity and the output of commodity, seed-bearing and mature tubers were determined (NIIKX; 1967); the seed quality of the buds was studied according to the experimental options (in terms of damage by viral diseases and the output of damaged buds and reproduction yield in the next year); productivity indicators were statistically processed using the Microsoft Excel program according to the dispersion analysis method [B.A. Dospikhov [10; pp. 280-285], B.J. Azimov, B.B. Azimov [3; pp. 181-185]. The economic efficiency of growing potato varieties after autumn siderates was calculated according to the method of the All-Russian Scientific Research Institute of Potato Farming (NIIKX; 1989).

The objects of study were old-irrigated and rain-fed typical gray soils of the Kashkadarya region, autumn rape - variety Nemerchansky-2268; oilseed radish – variety Rainbow; peas – variety Vostok-55; blue mustard – Yubileiny variety, mid-season varieties Marfona, Sante, Selvana, Pikasso.

Winter green manure: 1. Winter plowing (control); 2. Rapeseed - variety Nemerchansky-2268; 3. Oilseed radish - Rainbow variety; 4. Peas - variety Vostok-55; 5. Blue mustard - Yubileiny variety; 6. Peas + oilseed radish.

The plot area for green manure is 326 m², and for varieties 35 m², the experiment was repeated four times. Sowing of green manure crops was carried out in the fall of October 11-12, seeding rates: rapeseed - 12.0; peas - 80; gray mustard - 8.0; oilseed radish - 18.0 kg/ha, and when sowing crops together, the norm was taken in half. Fertilizers were applied at a rate of N-30 P-100 K-60 kg/ha. After sowing winter green manure, they were watered 3 times - in autumn and spring.

For winter green manure crops, 12-14 days before planting potatoes, the yield was determined during the period of mass flowering or heading, then using the KIR-1.5 unit it was crushed, disced and plowed to a depth of 28-30 cm.

In the experiments, all records, analyses, observations and activities were carried out on the basis of generally accepted methods and agricultural recommendations [3, 10]. Statistical processing of the obtained data was carried out using Microsoft Excel and SPSS (Statistical Package for Social Science).

Research results. During the autumn period, the dynamics of plant height growth were studied in the biometric measurements carried out on the 30-33 days of germination (23-26.11) after sowing the seeds of siderate crops. In the early stages of the growing season, the length of siderate crops is 26.5-28.8 in rapeseed, 30.5-32.8 in oil radish, 28.4-30.4 in sorghum, and 29.7-34 in blue mustard. ,8, and 26.7-30.4 centimeters in sorghum+oily radish, these parameters increased regularly in the last growth periods, and it was observed that during the flowering phase, siderate increased to 112.4-226.8 centimeters according to crop types (Table 1).

During the growing season of autumn siderate crops, before the winter dormancy period, the plant height, the number of stems and side branches, the root length and the thickness of the stem per 1 m² were determined. According to the type of siderate crops, in the initial development phases of the growing season, the plant height is 25.9-34.8 cm, the number of stems is 1-4.8, the number of lateral branches is 3.2-7.4, the thickness of the stem in 1 m² is 198 ,0-501.0 units, root length - 23.7-33.7 centimeters was found (Table 1-2).

In early spring, during the growth period of autumn siderate crops, the formation of growth organs is observed, according to the type of siderate crop, the plant height is 30.0-42.1 cm, the stem thickness per 1 m² in rapeseed is 470.0-475.0, in oil radish - 475 ,6-485.0, in buckwheat - 195.7-201.6, in blue mustard - 467.4-486.0, in buckwheat + oil radish - 475.7-499.2 pieces, root length in rapeseed - 63.4- 67.9, in oil radish - 65.3-69.7, in gorox - 38.5-52.1, in blue mustard - 64.3-70.4, in gorox + oil radish - 39.6-43.2 cm. was , these indicators increased according to the law, and the biomass before plowing into the ground, plant height in the flowering phase according to the type of siderate crops - 112.4-226.8 cm, the number of side branches - 6.7-25.7 units, root length - It was equal to 108.6-144 centimeters.

It was noted that the number of stems and the thickness of the stem did not change during the last growth periods. In autumn period, the highest height, stem and leafy, long root indicators were determined when blue mustard, oil radish, gorox+oil radish, gorox plants were planted.

In the flowering phase of the crop, the average thickness of the stem and the height of the plant per 1 m²: rape - 115.0, oil radish - 122.5, gorox (blue pea) - 207.6, blue mustard - 219.6 and gorox + 115.3

centimeters in oil radish, the thickness of the stem per 1 m²: in rapeseed - 473.0, in oil radish - 481.2, in gorokh - 198.7, blue mustard - 477.7 and gorokh (blue pea)+ in oil radish - was 489.8 units (Tables 1, 2).

Table 1 Growth dynamics of autumn siderate crops

	The name of siderat crops	Height of siderate crops, cm			
		23-26.11	26.02-1.03	17-20.03	27-30.03
2020					
1.	Rapeseed	28,8	38,9	96,1	115,6
2.	Radish with oil	32,8	41,7	99,1	125,0
3.	Chickpeas (green peas)	30,4	41,8	100,9	212,0
4.	Blue mustard	34,8	42,1	116,2	221,7
5.	Peas+Oil radish	30,4	33,0	100,3	218,5
2021					
1.	Rapeseed	26,5	35,2	91,6	112,4
2.	Radish with oil	30,5	35,3	88,2	111,5
3.	Chickpeas (green peas)	28,4	33,1	101,5	193,8
4.	Blue mustard	29,7	35,2	112,3	210,3
5.	Peas+Oil radish	26,7	30,3	96,6	204,9
2022					
1.	Rapeseed	27,1	32,8	98,3	117,0
2.	Radish with oil	31,4	35,7	103,1	135,0
3.	Chickpeas (green peas)	28,6	31,0	102,9	217,0
4.	Blue mustard	31,6	34,3	117,9	226,8
5.	Peas+Oil radish	28,5	30,4	101,5	222,5

Biomass yield of various siderate crops planted in the autumn term was 27.1-34.2 tons per hectare. The highest biomass yield was 34.2 tons per hectare when siderate oil radish was planted. Relatively high biomass yield (29.2-31.8 t/ha) was recorded when sorghum (green pea) + oil radish mixed and blue mustard were planted in pure form (Table 3).

After different autumn siderate crops, when studying medium-ripening potato varieties Marfona, Sante, Selvana, and Picasso, before the first irrigation during the growing season, the volume and mass in the plow layer (0-20 and 20-30 cm) of the soil tillage layer (0-20 and 20-30 cm) were 1.24 and was 1.29 g/cm³ and provided a decrease to 0.06 and 0.05 g/cm³ compared to the control (autumn plow).

Table 2 Biometric indicators of autumn siderate crops during the growing season

Siderate crop name and variety	35-35 days after germination				Plants in the growing season												
	23-26.11				26.02-1.03				18-21.03				27-30.03				
	plant height, cm	Number of plants per 1 m ² , pcs	number of stems, pcs	number of side branches, pcs	plant height, cm	Number of plants per 1 m ² , pcs	root length, cm	plant height, cm	number of stems, pcs	number of side branches, pcs	root length, cm	plant height, cm	number of stems, pcs	number of side branches, pcs	root length, cm	Number of plants per 1 m ² , pcs	
2020																	
1. Rapeseed	28,8	478,2	1	3,2	25,5	38,9	474,0	67,9	96,1	1	7,7	97,9	115,6	1	10,4	140	474,0
2. Radish with oil	32,8	488,5	1	6	28,9	41,7	483,0	69,7	99,1	1	16,6	98,3	125,0	1	25,4	129,6	483,0
3. Chickpeas (green peas)	30,4	201,5	3,8	3,6	26,4	41,8	198,8	52,1	100,9	3,8	5,1	95,0	212,0	1,8	7,8	112	198,8
4. Blue mustard	34,8	483,7	1	7,2	31,0	42,1	479,7	76,4	116,2	1	9,9	115,3	221,7	1	17,2	144	479,7
5. Peas+Oil radish	30,4	497,4	2,2/1	3,4	21,0	33,0	494,5	43,2	100,3	2,2/1	8,2	106,3	218,5	2,2/1	17,1	123	494,5
2021																	
1. Rapeseed	26,5	476,2	1	3,8	23,7	35,2	470,0	67,4	91,6	1	6,3	102,3	112,4	1	8,4	139,2	470,0
2. Radish with oil	30,5	481,5	1	6,1	27,0	35,3	475,6	66,8	88,2	1	14,4	98,0	111,5	1	20,9	120,3	475,6
3. Chickpeas (green peas)	28,4	200,1	4	4	24,8	33,1	195,7	48,5	101,5	4	4,4	95,3	193,8	4	6,7	108,6	195,7
4. Blue mustard	29,7	472,5	1	7,4	30,9	35,2	467,4	66,4	112,3	1	8,8	117,8	210,3	1	14,4	140,3	467,4
5. Peas+Oil radish	26,7	482,4	2,7/1	4,5	23,8	30,3	475,7	39,6	96,6	2,7/1	5,8	101,3	204,9	2,7/1	12,3	119,1	475,7
2022																	
1. Rapeseed	27,1	478,1	1	3,3	20,8	32,8	475,0	65,0	98,3	1	8,6	104,0	117,0	1	11,9	140,3	475,0
2. Radish with oil	31,4	488,1	1	5,2	33,1	35,7	483,0	65,1	103,1	1	16,6	101,3	135,0	1	25,7	128	483,0
3. Chickpeas (green peas)	28,6	196,0	3,3	3,3	30,8	31,0	201,6	38,5	102,9	3,3	5,0	96,1	217,0	3,3	7,0	110,5	201,6
4. Blue mustard	31,6	489,1	1	6,7	33,7	34,3	486,0	64,3	117,9	1	10,5	117,2	226,8	1	16,5	130,3	486,0
5. Peas+Oil radish	28,5	501,0	1,7/1	4	30,8	30,4	499,2	41,2	101,5	1,7/1	8,5	104,0	222,5	1,7/1	13,4	118,6	499,2

The potato varieties tested after the autumn gorokh (blue pea) and blue mustard were planted as siderates and their biomass was used as siderates before the first irrigation during the growing season. Up to 29 g/cm³ or decreased by 0.03 and 0.05 g/cm³ compared to the control (autumn plow).

It was observed that the soil volume mass increased by 1.31 and 1.36 g/cm³ in the plowing layer in the control (autumn plow) before the last watering of potato varieties during the growth period. After the application of sideration, the studied potato cultivars in the growing season before the last irrigation had a volume mass of 1.25 and 1.30 g/cm³ in the tillage layer and provided the greatest reduction of 0.06 g/cm³ compared to the control (autumn plowing) (Table 4).

Table 4 Changes in volume mass of the tillage layer with potato after different autumn siderate crops, g/cm³ (2020-2022)

№	The name of siderat crops	During the growth period of the potato plant			
		before the first watering		before the last watering	
		Soil layers, cm			
		0-20	20-30	0-20	20-30
		5-7.05		25-27.06	
1.	Control (autumn plow)	1,28	1,34	1,31	1,36
2.	Rapeseed	1,26	1,30	1,27	1,31
3.	Radish with oil	1,26	1,30	1,27	1,31
4.	Chickpeas (green peas)	1,25	1,29	1,25	1,30
5.	Blue mustard	1,25	1,29	1,25	1,30
6.	Peas+Oil radish	1,24	1,29	1,25	1,30

Кузги сидерат экинлар биомассаси сидерация қилиб қўлланилган вариантларда тупроқ ҳайдов қатлами ва остки қатламини гумус билан бойиши лаборатория таҳлиларида аниқланди.

Кузги муддатда сидерат экин қилиб кўк хантал, рапс, мойли турп, горох (кўк нўхат) соф ҳолда ва горох (кўк нўхат)+мойли турп аралаш экилиб, баҳорда яшил массаси сидерация сифатида қўлланилганда гумус миқдори 1,22-1,24 ёки 0,01-0,03% гача ортиб бориб, тупроқда кўпроқ чиринди тўпланишини таъминлади. Таҳлилимизда, горох+мойли турп аралаш ҳамда кўк хантал ва горох(кўк нўхат) соф ҳолда экилиб, сидерация қилиб қўлланилганда тупроқ гумусини йилдан йилга кўпайиб бориши аниқланди (5-жадвал).

5-жадвал Кузги сидератларнинг тупроқ агрохимёвий таркибига таъсири (Қашқадарё вилоят агрохимё марказий илмий лабораторияси, ҳайдов қатламда)

№	The name of siderat crops	Hummus, %	Gross, %			Active (exchangeable) form, mg/kg		
			N	P	K	N-NO ₃	P ₂ O ₅	K ₂ O
After the mass is buried in the ground, 28.04.2020								
1	Control (autumn plow)	1,21	0,095	0,166	3,0	6,64	29,0	312,0
2	Rapeseed	1,21	0,096	0,193	3,13	14,37	34,54	315,7
3	Radish with oil	1,21	0,096	0,192	3,14	14,54	33,65	315,8
4	Chickpeas (green peas)	1,22	0,097	0,189	3,10	22,39	31,72	313,6
5	Blue mustard	1,22	0,096	0,195	3,15	15,73	35,85	317,9
6	Peas+Oil radish	1,22	0,097	0,193	3,14	19,33	33,76	314,6
27.04.2021								
1	Control (autumn plow)	1,20	0,094	0,165	2,99	6,28	28,3	311,7
2	Rapeseed	1,22	0,097	0,196	3,16	16,21	37,23	319,6
3	Radish with oil	1,22	0,097	0,195	3,17	16,54	36,31	319,8
4	Chickpeas (green peas)	1,23	0,099	0,191	3,12	29,67	34,27	316,1
5	Blue mustard	1,23	0,097	0,198	3,18	19,62	37,56	323,3
6	Peas+Oil radish	1,23	0,099	0,196	3,17	27,83	36,33	319,5
26.05.2022								
1	Control (autumn plow)	1,19	0,093	0,164	2,98	5,85	27,4	310,1
2	Rapeseed	1,22	0,098	0,199	3,21	18,23	41,87	321,8
3	Radish with oil	1,22	0,098	0,198	3,23	18,67	39,56	322,1
4	Chickpeas (green peas)	1,24	0,102	0,194	3,16	33,56	38,49	319,4
5	Blue mustard	1,24	0,098	0,201	3,27	22,73	43,25	326,2
6	Peas+Oil radish	1,24	0,101	0,199	3,24	31,54	40,91	321,9

In the conditions of the typical gray soils that have been irrigated since ancient times in the Kashkadarya region, in the autumn term, on October 10-12, autumn rapeseed, blue mustard, oil radish, gorox (green peas) and in the spring term, on February 5-7, spring rapeseed and blue mustard siderate crops are grown for seeds. 6 options in 3 repetitions and Planted in 3 rotations, seeds and grains were planted at a depth of 1.5-2, oil radish - 3-4, gorokh - 6-7 centimeters.

In the experiment, the surface of each siderate crop field is 42 m² (10 m long, 4.2 m wide). The total area of Siderat crops is 252 m². When growing siderate crops for seeds, before autumn plowing, mineral fertilizers N30P60 K60 kg/ha were applied, taking into account soil fertility. During the growing season,

N30 kg/ha was fed with nitrogen fertilizers. Watered 2 times in autumn, 2 times in spring at the rate of 450-500 m³/ha. Phenological observations and biometric measurements were carried out during the growth and development of siderate crops.

Table 6 Biometric indicators in the cultivation of siderate crops for seed in the autumn term

	The name of siderate crops	Productivity indicators of a bush plant					
		Plant length, sm	The thickness of the stem in 1 m ² , pcs	number of stems and side branches, pcs	Average length of 1 stalk (pea, spike), cm	The number of seeds in 1 pod	Weight of 1000 seeds (grains), grams
		2020					
1.	Rapeseed	116,1	57,6	1/7	8,0	8,2	4,7
2.	Radish with oil	141,1	58	1/8	8,2	7,0	9,7
3.	Chickpeas (green peas)	240,0	95	4,1/6,4	9,3	6,3	66,3
4.	Blue mustard	199,5	54	1/7,6	10,2	10,6	3,9
		2021					
1.	Rapeseed	118,2	63	1/9,3	7,6	9,6	6,0
2.	Radish with oil	145,2	58,3	1/10	9,0	8,0	12,3
3.	Chickpeas (green peas)	276,6	96,6	4,7/9	12,3	9,3	64,7
4.	Blue mustard	281,2	55,6	1/10	10,6	10,6	4,1
		2022					
1.	Rapeseed	120,7	62	1/9	7,7	8,6	5,1
2.	Radish with oil	143,7	58	1/9	9,0	7,6	11,7
3.	Chickpeas (green peas)	281,1	94,3	4,6/9	12,0	8,0	64,1
4.	Blue mustard	284,8	54	1/9	10,6	11,0	4,0

Table 7 Biometric indicators in the cultivation of siderate crops for seed in the spring period

	The name of siderate crops	Бир гүп үсимлик махсудорлик кўрсаткичлари					
		Plant length, sm	The thickness of the stem in 1 m ² , pcs	number of stems and side branches, pcs	Average length of 1 stalk (pea, spike), cm	The number of seeds in 1 pod	Weight of 1000 seeds (grains), grams
		2020					
1.	Rapeseed	110,5	61,3	1/7	7,0	5,3	3,4
2.	Blue mustard	201,1	53,3	1/7,6	8,0	7,0	3,7
		2021					
1.	Rapeseed	110,6	63	1/7,6	7,6	5,6	3,5
2.	Blue mustard	203,8	54	1/8,6	8,6	7,3	3,6
		2022					
1.	Rapeseed	104,6	61,6	1/7	6,5	5,3	3,5
2.	Blue mustard	197,1	54,6	1/8,3	8,0	6,3	3,5

Rape. (*Brassica napus* L. ssp. *oleifera* Metzg.) Belongs to the Brassicaceae family, has two types: spring (annua) and autumn (biennis), an annual plant. Winter rape seed germinated 4 days after planting, and field seed germination was 87.7-92.5%. In early spring, rapid plant growth was observed, tillering - 12-14 days, flowering - 16-17 days, tillering and seed formation and maturation period 35-37 days, and ripening and full ripening phase lasted 16-25 days.

Biometric measurement was carried out in the flowering and ripening phase of the autumn rapeseed plant. In the flowering and ripening phase of rape grown for seed, the plant height per bush is 116.1-120.7 centimeters, the thickness of the bush is 57.6-63 pieces per 1 m², the number of stems is 1, the number of side branches is 7.0-9.3 pieces, It was found that the average length of 1 pod is 7.0-8.0 centimeters, the number of seeds in 1 pod is 8.2-9.6, and the weight of 1000 seeds is 4.7-6.0 grams (Table 6). Seed yield per hectare in autumn rape was 21.5-17.1 centners (Table 8).

Rapeseed seeds germinate in 3-4 days after planting in early spring, the field fertility of the seed is 83.4-85.3%, budding - 14-16, flowering - 16-18, pod and seed formation and maturation period 35-37 days and the ripening and full ripening phase lasted 14-26 days. Biometric indicators of spring rape during flowering and ripening and full ripening phase: plant height per bush - 104.6-110.6 centimeters, stem thickness per 1 m² - 61.3-63.0, number of stems - 1, number of lateral branches - 7 - 7.6 pieces, the average length of 1 pod is 6.5-7.6 centimeters, the number of seeds in 1 pod is 5.3-5.6, the weight of 1000 seeds is 3.4-3.5 grams it was found that (Table 7). On average, 15.4-12.2 centners of seeds per hectare were obtained in spring rapeseed (Table 8). The stems of the rapeseed plant are tall and covered with hairless waxy hair.

Table 8 Seed yield of cabbage siderate crops in autumn and spring periods, ts/ha

№	A type of siderate crops	Years			Average productivity
		2020	2021	2022	
1	Autumn rape	21,5	19,3	17,1	19,3
2	Autumn Blue Dumbbell	18,3	18,2	16,3	17,9
3	Spring rape	15,4	14,1	12,2	13,9
4	Spring blue mustard	14,7	12,8	11,4	12,9
$S_x^- = (\%)$		4,14	3,51	4,27	
$\text{ЭКФ}_{0,5}=(\text{t/ra})$		0,87	0,67	0,71	

Rapeseed seeds were found to be liver and black in color. Autumn rapeseeds ripened on June 1-5, spring rapeseeds on June 21-24. After harvesting, the seeds were cleaned from the pods and dried. Rapeseed seeds were stored in a cloth bag. We recommend planting rapeseed for seed in the fall period on October 10-12.

Gray mustard. Brassica juncea Czern and white mustard Sinapis alba L. is a herbaceous annual plant belonging to the cabbage family (Brassicaceae). Blue mustard seeds germinated in 3-4 days after sowing, and the field germination of seeds was 86.5-91.1%, tillering phase (budding) 8-10, flowering phase 21-25, cotyledon, seed formation and ripening period in cotyledon 33 -35, it was observed that the ripening and full ripening phase lasted 17-20 days.

Table 9 Seed and grain yield of autumn siderate crops, ts/ha

№	A type of siderate crops	Years			Average productivity
		2020	2021	2022	
1	Radish with oil	21,6	20,7	18,3	20,2
2	Chickpeas (green peas)	29,7	27,3	25,1	27,3
$S_x^- = (\%)$		2,37	2,14	3,34	
$\text{ЭКФ}_{0,5}=(\text{ts/ha})$		1,12	0,97	1,27	

In the biometric measurement, the tallest plant was recorded in autumn blue mustard planted for seeds, in the flowering and ripening phase of the plant, the height of the plant in one bush - 199.5-284.8 centimeters, the thickness of the bush in 1 m² - 54.0-55.6 grains, the number of stems - 1, the number of side branches - 7.6-10 pieces, the average length of 1 stalk - 10.2-10.6 centimeters, the number of seeds in 1 stalk - 10.6-11 seeds, the weight of 1000 seeds - 3 It was found to be equal to .9-4.1 grams (Table 6). The stem grows upright, strong, has many side branches, the lower part of the stem has sparse hairs, the upper part is hairless, and the lower part is covered with waxy dust. The lower leaves have a leaf band and it is divided into pieces, the upper leaf pieces are noticeably entire, hairless and covered with a small amount of waxy dust. At the time of ripening, the seeds fall out due to external influences. It was observed that the seeds are small round, the surface is different, yellowish-light brown. Blue mustard seeds, sown in autumn, ripened on June 4-7. The seed yield of blue mustard planted for seed in the autumn period was 18.3-16.3 centners per hectare (Table 8).

Blue mustard seeds planted in early spring also germinate in 3-4 days, field fertility is 83.3-84.6%, tillering (budding) 15-16, flowering 18 days, seed formation and ripening period in pods and pods 35-37 days and it was noted that the period of ripening and full ripening lasted 14-25 days (Table 7).

Measurements were made during the flowering phase of the growth period of the blue mustard plant grown for seed, pods and seed formation in the pods, and the ripening, ripening and full ripening periods of the seeds. In this case, the height of the spring blue mustard plant per bush is 197.1-203.8 centimeters, the thickness of the bush in 1 m² is 53.3-54.6 pieces, the number of stems is 1, the number of side branches is 7.6-8, It was found that 6 pieces, the average length of 1 pod is 8.0-8.6 centimeters, the number of seeds in 1 pod is 6.3-7.3, the weight of 1000 seeds is equal to 3.5-3.7 grams (Table 7). Seed yield of spring blue mustard was 14.7-11.4 centners per hectare (Table 8). Blue mustard seed moisture was dried to 12% and stored in a cloth bag at a temperature of +4...+5oC. Therefore, it is recommended to plant blue mustard for seed in the autumn term on October 10-14.

Oil radish. Raphanus sativus is a biennial plant belonging to the Brassicaceae family. The seeds of the oil radish plant planted for seed in the autumn period germinate 3-6 days after sowing, the field fertility is

87.1-93.6%, the tillering phase is 10-13, the flowering phase is 17-20, the formation and germination of seeds in the cobs and cobs 35 -37, it was observed that the ripening and full ripening phase lasted 8-16 days.

When oil radish was planted for seed in autumn, the biometric parameters of the plant were measured in the flowering, ripening and full ripening phases. In this case, the oil radish plant in the flowering and ripening phase has a plant height of 141.1-145.2 centimeters per bush, the thickness of the bush in 1 m² is 58.0-58.3, the number of stems is 1, the number of side branches is 8-10 pieces, length - 8.2-9.0 centimeters, number of seeds in 1 pod - 7.0-8.0 pieces, weight of 1000 seeds - 9.7-12.3 grams (Table 6). Oil radish seeds sown in autumn ripened on May 26-28. Oil radish seed yield was 21.6-18.3 centners per hectare (Table 9). The flowers of the Raduga variety are pink and white, and the fruit is a pod that does not split. It was observed that the color of the seed is reddish-brown in the phase of full ripening. Radish seed moisture was dried to 10-12% and stored in a cloth bag at +4...+5°C.

Chicken peas – *Pisum sativum* L. is an annual plant with erect stems at the beginning of the growing season. The middle of the stem is empty, it lies down easily. Stem length depends on soil fertility, agrotechnics and planting time. During the phenological observation, it was noted that the germination of gorokh (blue pea) seeds after sowing in the autumn period is 7 days, and the field fertility is 89.2-94.0 percent. It was observed that the period of formation and formation is 33-36 days, and the duration of grain ripening and full ripening periods is 14-16 days.

Biometric measurements were carried out during the flowering, pod and grain formation, ripening and full ripening of the plant during the cultivation of the gorokh (green pea) Vostok-55 variety, which was planted for seeds in the autumn term. In this case, in the flowering and ripening phase of the gorokh plant, the length of one bush is 240.0-281.1 centimeters, the thickness of the stem in 1 m² is 94.3-96.6, the number of stems is 4.1-4.7, the number of side branches is 6, It was found that 4-9 seeds, the average length of 1 pod is 9.3-12.3 centimeters, the number of grains in 1 pod is 6.3-9.3, and the weight of 1000 seeds is 64.1-66.3 grams (7 -table). The seeds of chickpeas, sown for sowing in the autumn term, ripened on June 3-5. Gorok (blue pea) - the seed yield of the Vostok-55 variety averaged 29.7-25.1 centners per hectare (Table 9). Harvested chickpeas were dehulled and dried to 14-16% grain moisture. After cleaning, buckwheat grains were stored in a cloth bag at a temperature of +4...+5°C.

In the spring, after the biomass of the autumn siderate crops was siderated and plowed into the soil, medium-early potato varieties Sante, Marfona, Selvana and Picasso were studied. Seed tubers of potato varieties were sown on April 3-5 at a depth of 6-8 cm in a scheme of 70x15 cm. During the growing season, after autumn siderate crops, potatoes were harvested 2 times and cultivated 2 times, and irrigated 8 times. The crop was harvested on July 14-15, measured by siderates, varieties, repetitions and the results were analyzed. The yield indicators of medium-ripening potato varieties Sante, Marfona, Selvana and Picasso were studied.

Germination was observed on the 12th-16th day after sowing for medium-early potato varieties studied in spring sideration options, and field germination of seed tubers was 99.4-99.9%.

Compared to the control (autumn plow), in the options where sideration was used, the germination of seed pods was 3-4 days earlier, and the field fertility was 2.9-3.4%, tillering was 1-4, flowering was 2-6 days longer, and the growth It was found that the period was extended by 2-9 days. In the options where spring sideration was used, the highest result was determined when the sideration of green peas (blue pea) biomass was used in the medium-ripening potato varieties Sante, Marfona, Selvana and Picasso. germination was 3-4 days earlier, tillering and flowering 2-6 days, growing period 6-9 days longer.

It was observed that the plant organs (leaf, stem and side branches) of medium-quick potato Sante, Marfona, Selvana and Picasso varieties studied in the spring sideration options grew and developed with optimal indicators.

In our observations, compared to the control (autumn plowing), in spring sideration options, on the 30th day of the growing season, the plant height of the studied potato varieties was 37.6-46.5 or 2.9-7.6 centimeters, and this indicator increased in the next 40-70 days of the growing season. -days were found to increase in height from 46.4 to 80.4 or 4.1 to 14.7 centimeters every ten days.

Compared to the control (autumn plowing), when the biomass of autumn siderate crops was used as sideration in spring, the formation of plant organs was higher in each bush on the 40-70th day of the growing season.

During the growing season of the medium-ripening potato varieties tested in the spring sideration options, the rapid formation of vegetative organs: leaves, stems and lateral branches was observed in the options that were used as a sideration, and in the options that were used as sideration, in the fall, siderate was planted as a siderate crop. on the 40th day of the growing season, the number of leaves in one bush is 138.3-144.8 or 18.7-17.1; stems 3.4-4.7 or 0.9-1.2; lateral branches were 3.2-3.7 or 0.9-1.1 more, these indicators legally increased during the growth period (50-60 days), and on the last 70 days of the growth period, the number of leaves per bush was 215.4 - 239.7 or 40.1-51.8 units, side branches increased to 7.7-8.9 or 2.8-3.6 units.

In the fall, when gorox (blue peas) were used for siderat, the medium-early potato varieties Sante, Marfona, Selvana and Picasso had 69.2-70.1 thousand m² of plant leaves per hectare. Compared to the control (autumn plow), there was 19.2-20.1 thousand m² of wide leaf area per hectare.

Plants with a relatively high leaf level (68.3-69.7 or 18.4-19.7 thousand m²/ha) in the varieties of potatoes Sante, Marfona, Selvana and Picasso are planted with siderate in the fall, mixed with gorox + oil radish and pure blue mustard. , was recorded in the variants where biomass was used as sideration in spring.

After the application of spring sideration, on the 60th, 70th, 80th, and 90th days of the growing season, according to the studied potato medium-ripening varieties Sante, Selvana, Marfona, and Picasso, 20 spring siderate variants of potato plants were dug up, and the number of tubers per stem in the formation of tubers per stem. and the average weight of one pod was determined by measuring.

In the options where spring sideration was used, when the medium-quick potato varieties Sante, Selvana, Marfona and Picasso were studied in one bush: yield of tubers, the number of tubers and the average weight of a single tuber when using gorox (blue pea), blue mustard pure and gorox + oil radish mixed as sideration. is the highest, compared to the control (autumn plow) on the 60th day of the growing season in one bush: the yield of buds is 387.7-312.4 or 129.6-60.1 grams, the number of buds is 5.0-4.2 or to 0.5-0.2 pieces, the average weight of one bud is 78.2-71.5 or 17.8-10.5 grams, these indicators increased on the 70-80th day, and the last growth period (90th day) in the bush: 661.6-654.3 or 248.2-198.5, respectively; 9.4-15.5 or 1.4-3.1; 76.3-96.2 or 7.6-18.3 was found to be high.

In the variants used as spring sideration, gorox (blue pea), blue mustard pure and gorox+oily radish mixed, in one bush layer of a plant of studied potato varieties: plant height (68.7-80.4 or 10.6-14.7 cm. ha), stem (3.8-4.4 or 0.9-1.0 pieces) and leaves (214.6-251.3 or 36.4-57.1 pieces), leaf weight (482.1- 500.4 or 183.6-194.4 grams), the number of pods (9.4-15.5 or 1.4-3.1 pieces) and the average weight of one pod (76.3-96.2 or 7.6-18.3 grams) was also high.

In the fall period, for siderat, gorox (blue peas), blue mustard in pure form and gorox + oil radish were sown, and in the options used as spring sideration, the yield of potato varieties was 28.4-36.9 tons per hectare, and compared to the control (autumn plow) 4.5-8.6 tons of additional yield was obtained per hectare.

In the fall term, gorox (blue pea), blue mustard in its pure form and gorox + oil radish were planted, and in the variants used as spring sideration, the highest yield was recorded in potato medium-ripening Selvana and Picasso varieties, the yield was 30.3-36.9 tons per hectare, and compared to the control (autumn plow), the additional productivity provided 5.9-8.1 t/ha or 124.1-128.1%.

As spring sideration, the biomass of rapeseed, oil radish, cowpea (blue pea), blue mustard in pure form and cowpea (blue pea) + oil radish mixed biomass was used. When the medium-early potato varieties were planted, the yield was 27.6-31.8 tons per hectare according to the varieties. or 3.7-7.7 t/h higher, 115.4-131.9% higher yield compared to the control (autumn plow) (Table 10).

When calculating the mathematical correlation between the increase of the surface of the leaf surface and the total productivity of the studied medium-ripening potato varieties in the options where spring sideration was used, it was noted that there is a positive correlation between them. The correlation coefficient between these two indicators is equal to $r=0.768$ ($R^2=0.6337$), and there is a high positive correlation.

Table 10 Yield indicators of the studied potato varieties after the application of autumn siderate crop biomass

№	The name of siderat crops	Productivity by years, t/ha			Average productivity, t/ha	Compared to control	
		2020	2021	2022		t/ha	%
Sante variety							
1	Control (autumn plow)	25,9	24,3	22,2	24,1	-	100,0
2	Rapeseed	29,4	27,7	26,8	27,9	3,8	115,7
3	Radish with oil	29,7	27,9	26,3	27,9	3,8	115,7
4	Chickpeas (green peas)	33,7	32,2	29,6	31,8	7,7	131,9
5	Blue mustard	30,5	29,0	27,3	28,9	4,8	120,0
6	Gorox+Oil radish	32,2	30,3	28,0	30,1	6,0	124,8
	$S_x^- = (\%)$	4,92	4,86	4,84			
	$\mathcal{E}K\Phi_{0,5} = (t/ha)$	1,86	1,93	1,79			
Marfona variety							
1	Control (autumn plow)	26,1	23,9	21,7	23,9	-	100,0
2	Rapeseed	29,3	28,0	25,5	27,6	3,7	115,4
3	Radish with oil	29,6	28,3	25,6	27,8	3,9	116,3
4	Chickpeas (green peas)	33,4	31,7	29,1	31,4	7,5	131,4
5	Blue mustard	30,5	28,1	26,6	28,4	4,5	118,8
6	Gorox+Oil radish	31,8	30,4	28,7	30,3	6,4	126,7
	$S_x^- = (\%)$	4,43	3,87	4,24			
	$\mathcal{E}K\Phi_{0,5} = (t/ha)$	1,52	1,50	1,54			
Selvana variety							
1	Control (autumn plow)	31,0	28,5	26,9	28,8	-	100,0
2	Rapeseed	34,7	33,1	31,0	32,9	4,1	114,2
3	Radish with oil	35,4	33,4	31,2	33,3	4,5	115,6
4	Chickpeas (green peas)	38,4	36,9	35,4	36,9	8,1	128,1
5	Blue mustard	37,1	34,4	32,7	34,7	5,9	120,4
6	Gorox+Oil radish	37,5	35,3	33,2	35,3	6,5	122,5
	$S_x^- = (\%)$	4,25	4,34	4,39			
	$\mathcal{E}K\Phi_{0,5} = (t/ha)$	1,61	1,59	1,66			
Pikasso variety							
1	Control (autumn plow)	26,4	24,2	22,6	24,4	-	100,0
2	Rapeseed	29,6	28,3	27,4	28,4	4,0	116,3
3	Radish with oil	30,4	29,6	26,2	28,7	4,3	117,6
4	Chickpeas (green peas)	34,2	32,9	32,0	33,0	8,6	135,2
5	Blue mustard	31,6	30,6	28,7	30,3	5,9	124,1
6	Gorox+Oil radish	33,3	32,5	29,6	31,8	7,4	130,3
	$S_x^- = (\%)$	4,17	4,61	5,03			
	$\mathcal{E}K\Phi_{0,5} = (t/ha)$	1,73	1,78	1,97			

In the fall period, siderate is planted with gorokh (green peas) and blue mustard, pure and mixed with gorokh oil radish, and when the biomass is used as spring siderate, the yield of medium-quick varieties of potatoes is 28.4-36.9 tons per hectare, net profit is 16.7- 29.3 mln. soums, the level of profitability was noted to be 62.9-83.7%.

Conclusions:

1. In the conditions of ancient irrigated typical gray soils, during the fall term, when siderate was cultivated and rapeseed, oil radish, sorghum and blue mustard were planted in pure form and mixed with sorghum + oil radish, it was found that the biomass yield was 27.1-34.2 tons per hectare in spring.
2. The agrophysical and fertility characteristics of the soil improved after the application of autumn crop biomass, and the percentage of macroaggregates increased by 12.9-26.1% in the tillage layer compared to the control when sorghum, blue mustard, rapeseed was used in pure form and sorghum + oil radish in the autumn period. , the volume mass improves by 0.01-0.06 g/cm³, the humus content increases by 1.22-1.24 or 0.01-0.03%.
3. In the autumn term, when seed siderate crops are rapeseed, oil radish, sorghum and blue mustard, and in the spring term, when rapeseed and blue mustard siderate crops are planted by seed, the seed yield

per hectare is 17.5-21.5 in autumn rapeseed, and 16.3 in autumn blue mustard. -18.3, oil radish 18.3-21.6, gorox 25.1-29.7, centner, spring rape-12.2-15.4; 11.4-14.7 centners were obtained in blue mustard.

4. In the variants where spring sideration was used, the field germination, germination rate, growth and development of the studied medium-fast potato varieties of seed nodules were high, especially when using gorox, blue mustard pure and gorox + oil radish mixed, medium-speed potato varieties Sante, Marfona, Selvana and Picasso were seeded. It was found that the field fertility of the tubers increases by 2.9-3.4%, and the growth period is extended to 6-9 days.
5. When siderate crops are used, the growth and development of medium-early potato varieties is faster than early-early potato varieties, the plant height is 68.7-80.4 or 10.6-14.7 cm. ,9-1.0 more), wide leaf surface (66.3-70.1 or 16.7-20.1 thousand m²), strong palak (402.0-500.4 or 164.1-194.4 grams) and formed a root system. As a result, the productivity indicators for these varieties were 572.7-654.3 grams per bush, the number of buds was 9.4-15.5, and the average weight of one bud was 76.3-96.2 grams.
6. In the autumn term, buckwheat (green peas) and blue mustard were planted in pure form and in a mixture with buckwheat + oil radish, and the yield per hectare was 28.4-36.9 tons were taken. Then, compared to the control (autumn plow), the additional yield was 4.5-8.1 t/ha or 18.8-28.1% higher.
7. In the fall period, as a siderate crop, it is planted in a mixture with blue mustard, gorox (green peas) and gorox+oily radish, and when the biomass is used as spring sideration, 16.7-29.3 million per hectare of medium-ripening potato varieties. soum additional net profit or 12.2-30.6% profitability level was achieved.

References:

1. Орипов Р.О. и д. Сидераты в борьбе с засоренностью полей. // Ж. Сельское хозяйство Узбекистана. - 1972.- № 8.- С.15-17.
2. Орипов Р. Фитосанитарное и биоэнергетическое значение промежуточных культур. – Т.: - 1988.- С.50.
3. Азимов Б.Ж., Азимов Б.Б. Сабзавотчилик, полизчилик ва картошкачиликда тажрибалар ўтказиш методикаси. - Т.: “Ўзбекистон миллий энциклопедияси”, 2002. –Б.181-185.
4. Ayed F, Daami-Remadi M, Jabnoun-Khiareddine H, El Mahjoub M. Effect of potato cultivars on incidence of *Fusarium oxysporum* f. sp. *tuberosi* and its transmission to progeny tubers//J Agron. – 2006. 5: 430-434.
5. Холиков Б.М. Повторные культуры и плодородие почвы. // Ж. Ўзбекистон кишлок хўжалиги. – Т.: - 2004. - № 5. – С.42.
6. Al-Khatib K., Libbiy C., and Boydston R. Weed suppression with Brassica green manure crops in green pea Weed sci// Can. Jour. Soil Sci. – 1997. Vol 45(1): - p. 439-445.
7. Andy Mcluire at all. Green Manuring with Mustard. Agrichemikal and Environmental news// June. – 2003. issue 206, www. Ae news.wsu.edu/ june 03.
8. Acuna, Ivette, Barry Jacobsen, Dennis Casini and Joseph Pavek. Thaxtomin-A Lon Susceptibility Seedling and Tuber ScabResistance// Abstracts of the 83 rd Annual Meeting of the Potato Association of America. August 1-6, Somerset new jersey, USA. –1999. - Vol. 76(6): - p. 363.
9. Biederbeck VO, Rasiyah V, Campbell CA, Zentner RP. and Wen G. Soil quality attributes as influenced by perennial forages used as green manure// J. Soil Biolog. Biochem. – 1998. -Vol. 30(3): -p. 1177-1185.
10. Доспехов Б.А. Методика полевого опыта. - М.: “Агропромиздат”. - 1985. - С.351.
11. Davis J.R., Huisman O.C., Westermann D.T., Everson D.O., Sorensen L.H. and Schneider A.T. Alternative approaches for control of *Verticillium* wilt of potato with sudangress// Amer. J. of Potato Res. – 1997. - Vol. 76(4): - p. 292-295.
12. Kirkegaard JA, Wong PTW, Desmarchelier JM. In vitro suppression of fungal root pathogens of cereals by Brassica tissues// Plant Pathol. - 1996. 45: 593-603.
13. Neubauer C, Heitmann B, Müller C. Biofumigation potential of Brassicaceae cultivars to *Verticillium dahliae*// Eur J Plant Pathol. – 2014. -140: 341-352.
14. Glais L, M Tribodet, JP Gauthier, S Astier-Manifacier, C Robaglia, and C Kerlan. RFLP mapping of the whole genome of ten viral isolates representative of different biological groups of potato virus Y// J. Arch Virol. - 1998. – Vol. 143(8): - p. 2077-2091.

15. Conklin A.E., Erich M.S., Liebman M., Lambert D., Gallandt E.R. and Halteman W.A. Effects of red clover (*Trifolium pratense*) green manure and compost soil amendments on wild mustard (*Brassica kaber*) growth and incidence of disease// *J.Plant Soil.* – 2002. - Vol. 238(3): -p. 245-256. (PDF).
16. Lazzeri L. and Manici L.M. Allelopathic effect of glucosinolate containing plant green manure on *Pythium* sp. and total fungal population in soil// *J.Hort Science.* – 2001. -Vol. 36(7). - p.1283-1289.
17. Larkin RP, Honeycutt CW, Olanya OM. Management of Verticillium wilt of potato with disease-suppressive green manures and as affected by previous cropping history// *Plant Dis.* - 2011. 95: 568-576. <http://www.apsnet.org/publications/plantdisease/2010/December/Pages/94.12.1491.aspx>.