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FORMATION OF THE YIELD OF MELILOT UNDER THE COVER METHOD OF SOWING UNDER THE CONDITIONS OF RICE CROP ROTATION

Abstract

This article presents research on the study of elements of the technology of cultivation of melilot in the cover crop of barley. Studies have shown that the rate of sowing barley seeds in the range from 2 to 3 million seeds / ha and the nitrogen dose from 30 to 60 kg / ha are optimal, which significantly reduces the oppressive effect of cover culture, increases the survival rate of melilot plants –by 10.4-27.5%. This method of sowing contributes to the destruction of weeds, which eliminates the use of expensive herbicides and obtaining environmentally friendly products. The effective of using barley as a cover crop for perennial legumes is shown, while barley plants in the initial phase of vegetation grow very quickly and intensively and create the best conditions for the growth and development of melon on saline soils, shading them from direct sunlight. The research results were implemented in rice farms of Kyzylorda region on an area of 500 hectares, the net income was within 45.0-50.5 thousand tenge/ha, the profitability of 110%.

Keywords*: cover culture, melilot, fertilizer, seeding rate, survival rate, yield, yield of melilot hay, density of standing plants, diversification of crop production.*

Introduction. The main rice-growing region of the Republic of Kazakhstan is the Kyzylorda region, which is located in the zone of ecological disaster of the Aral sea region. In recent years, the cultivation of agricultural crops in this region has been limited by water resources caused by human activities. In addition, on the drained bottom of the Aral sea, a salt marsh desert with an area of about 1.0 – 1.5 million hectares was formed, from which about 150 million tons of salt dust rises annually with constant winds, which pollutes the atmosphere, the hydrosphere, and has a detrimental effect on the environment. In the current extreme conditions, crop production in the region should be based on an effective system of agriculture with the maximum use of biologization methods, optimization of the nitrogen regime with a wide use of the potential of high-protein new alternative crops. Therefore, of particular value is the introduction of a new crop - melilot, highly productive potential, which allows you to grow it on low-fertile and saline soils, where other cultivated perennial grasses in rice crop rotations are very thinned and do not provide proper productivity of fields.

Perennial legumes are rich in protein, serve as accumulators of biological nitrogen in the soil, increase the content of humus and improve the structure of the soil. Cultivation of low-spread, but highly productive, multi-functional legumes will help to increase soil fertility, increase crop production and reduce the shortage of feed and protein [1-3]. Such leguminous plants include the biennial melilot, which has valuable economic and biological properties: undemanding to soil fertility, stability of feed and seed productivity. It tolerates temporary waterlogging and drought.The main advantage of melilot is the accumulation of nitrogen fixed by nodule bacteria from the air. These bacteria form nodules on its roots and mutually cohabit with the melilot. Bacteria provide the host plant with nitrogen, in return they receive carbohydrates from it. According to N. p. Kryukov, the amount of nitrogen accumulation in the above-ground crop due to biological nitrogen reaches from 72.2 to 82.9 kg/ha in the sub-cover crop [4].

Due to its economically valuable characteristics, melilot feed is obtained cheap and high-quality. Cover crops sometimes lead to the complete death of melilot, especially at high seeding rates

and high doses of fertilizers. Many researchers recommend reducing the oppressive effect of cover culture on the sown melilot to reduce the rates of seeding and fertilizer doses by 30-50%. The huge influence on the growth and development of melilot, and, ultimately, on its yield has cover culture. In melilot crops under the cover of barley, a competitive relationship between these plant species and weeds is created. The essence of this competitive relationship is that any plant in the course of its life changes the environment and thus affects the plants that grow together with it. Scientists note that the competitive ability of species depends on the conditions of growth with the alignment of other factors. For each species, there are certain limits to the combination of factors at which the species is most competitive. Plants often react more strongly to the deterioration of growing conditions in mixed than in single-species crops, and the degree of severity of the negative reaction is due to the species with which this plant grows together [5].

In modern conditions of development of agriculture of the Kyzylorda region, animal livestock is a priority, which primarily depends on the availability of fodder. The primary task of the crop industry in the region is the introduction of low-water consumption, high-protein feed crops into rice crop rotations, which will expand the production of an assortment of agricultural products and eliminate the protein deficit when fattening animals. In this regard, in order to improve the soil and environmental conditions of cultivation of agricultural crops, it is necessary to have science-based recommendations that ensure the restoration, regulation of soil fertility and increase crop yields. At the same time, the development of techniques for regional technologies of cultivation of perennial legumes in sub-cover sowing in the conditions of rice crop rotation is at the forefront. Also, in the future, to increase the productivity of melilotus in the acutely arid conditions of the Kyzylorda region, it is necessary to study and determine the optimal irrigation regime.

Materials and methods of research. The climate of Kyzylorda region is sharply continental, hot dry summers and cold, with unstable snow cover winter. The average annual air temperature is 9.8°C. the Climate of the region is very dry. The average annual precipitation is 129 mm. in some dry years, they may fall only 40-70 mm. The soil of the experimental site is meadow-marsh, typical for rice crop rotations in the region. It is characterized by a low humus content up to 1%, reduced porosity and a fairly high value of a dense residue of 0.6-0.8%. Type of salinity-sulphate, medium-saline. Soil analyses were carried out in the analytical laboratory of the Kazakh research institute of rice groving (table 1).

Objects of research were varieties of barley - Rassava and melilot is Alsheevsky. Place of research – research and experimental site of the Kazakh research Institute of rice groving. Agrotechnics generally accepted for this zone: winter tillage dump plowing to a depth of 22-24 cm; early spring disking BDT-7.0, leveling the surface of the check with a long-basal planner, plowing to the depth of 16-18 cm, disking BDT-7.0, harrowing in two tracks BZTU-1, skating ring rinks ZKK-6.

The results showed that increasing the seeding rate cover crop from 2 to 4 million seeds/ha with simultaneous increase of the dose of nitrogen fertilizer from 30 to 60 kg/ha, that contributed to the formation of a more powerful above-ground mass of barley and weeds, which ultimately led to thinning, the slow growth and development of plantsof melilotus. The greatest death of melilot plants was observed in the early period of ontogenesis – in the phase of the appearance of two leaves.When studying the seeding rate of cover culture of barley, the density of melilot plants standing on the background without fertilizers, depending on the seeding rate from 2 to 4 million pieces/ha, ranged between 249 and 270 pieces/m^2, barley – 176-205 pieces/m^2. Before harvesting, the number of barley plants at the seeding rate (4 million pcs/ha) was (180 pcs/m^2), that is, more than the low (2 million pcs/ha) rate. However, in the process of ontogenesis was observed a significant reduction in plant density of melilot at a high seeding rate of barley at value - 4 million pcs/m^2 to 103 pcs/m^2, that is, the cultivation of melilot under a cover crop of barley contributes to a more powerful above-ground mass of barley and weeds, which ultimately leads to thining melilot (table 2).

Table 1 – Characteristics of the soil experimental site

Level,cм	pH	mV	Denseresidue%	Anions, % / mg-eq per 100g of soil				Kations, % / mg-eq per 100g of soil			The amount sols%	Type of salinization
				CO_3	HCO_3	Cl	SO_4	Ca	Mg	Na		
0-20	7,64	-24	0,78	0	0,023	0,015	0,583	0,16	0,046	0,016	0,848	sulphatemedium-saline
				0	0,462	0,5	12	8,3	3,75	0,700		
20-40	7,55	-19	0,65	0	0,029	0,013	0,605	0,15	0,046	0,025	0,864	sulphatemedium-saline
				0	0,351	0,4	12,3	8,4	3,75	1,100		

Table 2- The density of the plants stand and stalk of the melilot, depending on the rate of sowing barley seeds and fertilizers.

Fertilizer кg/ha	Seeding rates in million seeds / ha	Number of plants, pcs / m^2							
		first year				melilot at the end of the growing season	thining, %	secondyear	
		byshoots		before harvesting				Beginning of growth	stalks
		barley	melilot	barley	melilot				
Control - withoutfertilizers.	2	176	249	143	165	135	54.2	91	268
	3	199	266	167	106	104	59.0	85	216
	4	205	270	180	113	91	67,4	66	183
$P_{60}N_{30}$	2	195	236	189	177	151	57.4	103	307
	3	218	238	216	143	121	50.8	91	287
	4	250	215	235	143	101	47.0	72	215
$P_{60}N_{60}$	2	181	282	148	175	132	47.0	84	316
	3	242	302	198	147	119	38.4	77	292
	4	370	295	299	87	85	19.5	32.5	207

The increase in the seeding rates of cover culture on the shoots of melilot provides a density of standing plants of mixed seeding only 425-475 hcs/m^2 including melilot 249-270 pcs/m^2, of this number at the end of the growing season, 293 – 308 plants were preserved, and melon including - 91 and 135 pcs / m^2. Oppression of melilot plants was observed with an increase in the rate of barley seeding to 4 million pieces/ha, where the thinning rate of melilot plants was 67.4 %.

The obtained results showed that the highest density of plants and the optimal stem of melilot were obtained when applying fertilizers-$P_{60}N_{30}$ and the seeding rate of cover barley is 2-3 million pieces/ha (for shoots 236-238 pieces/m^2, before the 1st mowing 143-177, at the end of the growing season 121-151 pieces / m^2).

An increase in the seeding rate of barley to 4 million and the nitrogen dose against the background of p60n60 phosphorus led to a decrease in the density of melilot plants (147 before harvesting, 119 PCs/m2 at the end of the growing season). At the beginning of regrowth in the second year of life, at high rates of sowing melilot culture, only 32.5 PCs/m2 of plants remained, that is, the melilot was thinned by 2.3 – 2.5 times. In the control version of the melilot plant, depending on the barley seeding rate, 103 – 165 remained before harvesting, 91 - 135 at the end of the growing season, and 66 – 91 PCs/m2 at the beginning of the 2nd year of life.

It was found that the seeding rate (2-3 million pieces / ha) and the nitrogen dose (30-60 kg / ha) is optimal, which significantly reduces the oppressive effect of the cover culture, increases the survival rate of melilot plants –by 10.4 – 27.5% (table 3).

Table 3 –The formation of the yield of melilot depending on the doses of applied fertilizers and seeding rates of cover culture (barley)

Fertilizers, kg / ha	Seeding ratesof barley in million seeds / ha	Yield, ce / ha				
		barleygrains	the yield of melilot hay			thefoliage, %
			first year	second year	total for 2 years	
Control - withoutfertilizers	2	15,7	30,2	113,0	143,2	32,1
	3	18,3	23,7	86,7	110,4	32,8
	4	19,4	13,9	57,4	71,3	30,9
$P_{60}N_{30}$	2	28,3	42,8	157,0	199,8	48,1
	3	32,4	32,2	139,0	171,2	49,3
	4	35,8	16,1	93,0	109,1	47,4
$P_{60}N_{60}$	2	30,6	47,7	127,0	174,7	36,3
	3	34,0	40,5	113,0	153,5	37,2
	4	38,5	16,9	87,0	103,9	35,5
SSD_{05}(smallestsignificantdifference)		3,7	4,6	4,1		

In our experiments, the yield of cover barley grain, depending on the seeding rates and doses of fertilizers, ranged between 15,7 and 38,5 ce/ha.in the variant with $P_{60}N_{30}$, the yield of barley was 28,3 – 35,8 and when $P_{60}N_{60}$ was applied, 30,6 – 38,5 ce/ha, and in the variant without fertilization, 15.7 – 19.4 ce/ha, where the yield of cover culture decreases by 12,6 – 19,1 ce/ha (from 28,3 – 38,5 to 15,7 – 19,4 ce/ha). The yield of the cover crop is significantly affected by the seeding rate, with an increase in the seeding rate, the barley yield increases at the control of 3,7 ce/ha, when applying fertilizers $P_{60}N_{30}$-7,5 and $P_{60}N_{60}$ – 8,0 ce/ha.

The yield of melilot hay in the 1st year of life at the seeding rate of 2 million pcs/ha, depending on the background of fertilizers applied, was 30,2 – 47,7 ce/ha. In the second year, the yield of hay, depending on the biological characteristics of melilot plants, was 2,7 (127,0 ce/ha) and 3,7 (113 ce/ha) times higher than in the first year. With an increase in the cover crop seeding rate, the yield of melilots for hay in the first and second years of life decreases by 53,9-64,6 % in the first year and 31,5-49,2 % in the second year.

The highest yield of hay and seeds of melilots, in total for 2 years, reached 153,5 – 199,8 and 13,4 – 17,7 ce/ha, respectively, was obtained at the seeding rate of 2 – 3 million pieces/ha against the background of P60 with the introduction of 30 – 60 kg of nitrogen per 1 ha, and increasing the seeding

rate to 4 million pieces/ha reduces the yield of the 1st year of life by 26,7 – 30,8 ce/ha (from 42,8 – 47,7 to 16,1 – 16,9), the second – by 40 – 64 ce/ha (from 127 – 157 to 87 - 93).

When cultivating melilot under cover culture, the leafiness of plants is of great importance, with an increase in the number of leaves and increases productivity. In the control variant, the leafiness of melilot plants, depending on the seeding rate of the cover crop, fluctuated between 30,9 and 32,8 %. Studies have shown that a significant influence on the leafiness of melilot plants is provided by the introduction of phosphorus-nitrogen fertilizers, so when applying a dose of $P_{60}N_{30}$, the leafiness increases to 35,5-37,2 % and to 47,4-49,3 % when applying a dose of $P_{60}N_{60}$. We found that the greatest leafiness of melilot plants above 49,3% is provided by the introduction of 2 and 3 million pieces/ha of cover culture at the seeding rate, where the yield for hay increases from 110,4-143,2 ce/ha to 171,2-199,8 ce/ha, respectively.

Thus, when cultivating melilot under the cover of barley in rice crop rotations on meadow-swamp saline soil, the optimal seeding rate of the cover crop is 2-3 million pieces/ha against the background of mineral fertilizers $N_{30}R_{60}$, where the oppressive effect of the cover crop is significantly reduced, the survival rate of the melilot plants increases by 10,4-27,5%, leafiness by 12,0-16,5%, and yield by 22,0-55,1%.

Conclusion. The introduction of this cultivation technology in rice crop rotations makes it possible to effectively use the natural soil moisture after rice. After harvesting the barley, the melilot grows well enough, which allows you to get another full cut before the fall. In addition, the Kazakhstan area of the Pri-Aral region, where rice is the main crop preparation for sowing of rice begins in late april, and sowing barley is in march, so it removed 2 months earlier than the main crop (rice), that enables more efficient use of technics, to reduce the tension of the field work. At the same time, it is necessary to emphasize the invaluable role of these crops in the conditions of increasing water scarcity. Thus, due to the ability of diversification crops in arid conditions to expend moisture economically, using the natural moisture of the soil after rice, they are able to form a high yield without a single irrigation, which helps to save 6000 m3 of water per hectare.

The results of the research were implemented in rice farms of the Kyzylorda region on an area of 500 hectares, the profitability of 110%.

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ТҮЙІН

Бұл мақалада бүркеме арпаның егістігінде түйежоңышқаның өсіру технологиясының элементтерін зерттеу бойынша нәтижелері көрсетілген. Зерттеу көрсеткендей, арпа тұқымдарын себу нормасы 2 –ден 3 млн.дана/га – ға дейін және азоттың дозасы 30-дан 60 кг/га-ға дейін оңтайлы болып табылады, бұл ретте бүркеме дақылдың бәсеңдейтін әсері едәуір төмендейді, түйежоңышқа өсімдіктерінің өміршеңдігі -10,4-27,5% - ға артады.Бұл себу әдісі арамшөптерді жоюға ықпал етеді, сонымен қымбат гербицидтерді қолдануға жол бермей экологиялық таза өнім алуға ықпал етеді. Арпаны көпжылдық шөптер үшін бүркеме дақылдар ретінде пайдалану тиімділігі көрсетілген, бұл ретте арпа өсімдіктері вегетацияның бастапқы фазасында жылдам және қарқынды өсіп, әсіресе тұздалған топырақтарда жер бетіне көленке түсіріп түйежоңышқа өскіндеріне қолайлы жағдай жасайды. Зерттеу нәтижелері Қызылорда облысының күріш өсіру шаруашылықтарында 500 га алаңда енгізілді, таза табыс 45,0-50,5 мың теңге/га шегінде, пайдалылығы 110% құрады.

РЕЗЮМЕ

В данной статье представлены исследования по изучению элементов технологии возделывания донника в покровном посеве ячменя. Исследования показали, что норма высева семян ячменя в пределах от 2 до 3 млн. шт/га и доза азота от 30 до 60 кг/гаявляются оптимальными, при которых значительно снижается угнетающее действие покровной культуры, увеличивается выживаемость растений донника –на 10,4 – 27,5%. Данный способ посева способствует уничтожению сорняков, что исключает применение дорогостоящих гербицидов и способствует получению экологически чистой продукции. Показана эффективность использования ячменя как покровной культуры для многолетних трав, при этом растения ячменя в начальной фазе вегетации очень быстро и интенсивно отрастают и создают лучшие условия для роста и развития донника на засоленных почвах, затеняя их от прямого попадания солнечных лучей. Результаты исследований внедрены в рисоводческих хозяйствах Кызылординской области на площади 500 га, чистый доход составил в пределах 45,0-50,5 тыс.тенге/га, рентабельность 110%.

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ЗНАЧЕНИЕ СОРГО КАК КОРМОВОЙ КУЛЬТУРЫ ДЛЯ «ЗЕЛЕНОГО КОНВЕЙЕРА»

Аннотация

В мировом масштабе объемы производства сорго сравнительно небольшие – под посевами культуры занято около 41 млн га земли, а производство составляет 61 млн тонн, в то время как, к примеру, объемы производства кукурузы превысили 1 млрд тонн. Тем не менее, с этими показателями сорго занимает 5-е место в мире среди зерновых культур.

Малоизвестная культура сорго, за последние десять лет получила достойное место среди сельскохозяйственных зерновых культур. Культура в процессе селекции вобрала в себя немало полезных веществ. Сорго сохраняет свой потенциал полезности, за счет неприхотливости и высоких урожаев. Растение активно используется как крупными агропромышленными предприятиями, так и малыми хозяйствами в севообороте и для удовлетворения кормовых нужд.

Эксперименты проводили на полях ТОО «Уральская опытная сельскохозяйственная станция». Погодные условия в годы исследований были умеренно влажные. Изучались три срока посева: 15 мая, 25 мая, 5 июня. По итогам исследований было выявлен лучший срок посева сорго зернового при возделывании на семена – 25 мая, так как нет существенных различий по урожайности семян между весенними сроками посева, а посевные качества и выход кондиционных семян выше.

Ключевые слова: *зерновое сорго, зеленая масса, корма, урожайность, сроки посева.*

Введение. Производство кормов – важная часть сельскохозяйственного производства Республики Казахстан. В настоящее время в первую очередь решается проблема кормового протеина, но необходимо отметить и огромное значение углеводов в рационе животных. Это основная часть (70-80%) сухого вещества растительных кормов. Углеводы играют большую роль в обмене веществ, связанном с окислением, переаминированием аминокислот, синтезом жира, минеральным обменом [1].

Исключительная засухоустойчивость, высокая продуктивность и кормовые достоинства ставят сорго в ряд наиболее перспективных кормовых культур. Культура сорго легко приспосабливается к разным почвенно-климатическим условиям. Корневая система у сорго