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## **THE ROLE OF INTERCROPPING IN THE PRODUCTION OF BALANCED FEED**

### **Abstract**

In only within for 5 years in the Republic of Kazakhstan it is planned to construct about 60 feedlots with single keeping of 150 thousand heads or 300 thousand heads a year. Now in feeding complexes young growth is grown up and fattened in the extensive way on unbalanced diets that leads to large expenses of forages and work for gain unit. Therefore one of the important conditions of further increase in beef production is the development of effective technologies of providing feeding complexes and farms of industrial type with own food supply, at economical expenditure of fodder grain.

As a result of carried out researches, the data allowing to estimate efficiency of mixed crops of fodder crops at different terms of harvest for their use in technologies on own forages production in feeding complexes and industrial type farms in conditions of West Kazakhstan region were obtained.

***Key words:** feeding complexes, mixed agrophytocenosis, efficiency, forage crops, protein, exchange energy.*

Cultivation of mixed seeds of forage crops is important at the increase of collecting fodder protein. According to the researches carried out in different countries even such grain feed crops as barley do not satisfy completely zootechnical norms of animals' food at harvest for monoforage. Its combination with high-proteinaceous components gives real chance to receive highly nourishing and balanced grain feed forage. Long-term scientific and operating experience says that mixed crops of grain feed crops with leguminous are good raw materials for preparation of high-quality forages of the increased nutritiousness. Barley mixes with chick-pea provide grain feed forage rich with protein, with the sufficient sugar content. At the cultivation of barley and chick-pea mix, collecting of protein depends on harvest terms. The sufficient digestible protein content is noted in fodders from mixes harvested at dairy and wax ripeness phase. The content of 1 fodder unit in haylage with digestible protein was 115 g that is 28,6 g higher than at traditional terms of harvest. Many researchers suggest to carry out preparation of haylage from the mixes of one-year crops (barley+chickpea), to carry out harvest by direct combining at dairy and wax ripeness phase. The output of nutrients decreases from 1 hectare in earlier and later terms. Forage nutritiousness decreases as well. According to the three-year data, collecting of dry substance at dairy and wax ripeness phase of barley and chickpea mix in comparison with dairy ripeness of grain increases from 25,1 to 38,9 c/hectare, protein from 371,3 to 494,2 kg/ha [1-5].

The work was performed within the program of grant financing of Science Committee of MES RK on «Development of technology on production of own forages for feeding complexes and industrial type farms» project in 2015-2017 years.

The purpose of researches is development of the technology providing productions of own forages balanced on protein in conditions of feeding complexes and industrial type farms.

Field experiments were put on the experiment field of Zhangir khan WKAU for the objectives solution.

Soil of experiment site is dark-brown heavy loamy. On morphological features of genetic bedrocks of profile and agrochemical indicators of arable layer, the soil of experiment site is characteristic for dry steppe zone of West Kazakhstan.

The area of allotments is 50 m<sup>2</sup>, frequency is triple, arrangement of allotments is random. Agrotechnology of forage crops cultivation is accepted, grades are zoned for West Kazakhstan region.

Important indicators which substantially determine the level of agrophytocenosis efficiency are the density of standing of plants and their survival during vegetation.

The analysis shows that optimum conditions on viability of barley seeds both in one-specific and in the mixed crops with chick-pea have been created in the conditions of 2016. In 2015 and 2017, the viability of forage crops seeds has been reduced. The completeness of barley sprouting changed by the test options from 94,4 to 95,2%, and in one-specific crops it was 96,4% on average for 3 years in the mixed crops. The viability of chick-pea by the test options fluctuated from 85,0 to 87,5%.

By the time of chick-pea harvesting, there was some reduction of plants quantity by all options. For 3 years of researches, the survival of chick-pea in the mixed crops depending on the term of harvesting was from 70,44% (2015) to 81,08% (2017). The survival of cereals was (barley) in the mix with chick-pea from 72,25% (2015) to 84,29% (2017).

For 3 years, the safety of barley in pure form to the harvesting in full ripeness phase has averaged 83,63%. In general, the safety of barley was purely higher in comparison with plants of the mixed crops with chick-pea, except for the option of mix harvesting in earlier phases – in blossoming phase of chick-pea for green forage where the safety of barley by the harvesting for 3 years has averaged 83,21%. On other options, the safety of barley by the harvesting has decreased from 78,56% (harvesting in dairy ripeness phase) to 74,24% (full ripeness harvesting).

In general, for 2017, the safety of barley plants and chick-pea in agrophytocenosis was higher in comparison with 2015. However, as test data shows, the highest safety of crops was noted by us in 2016 that relates to favorable conditions of moisture and heat security of crops.

Thus, the study of plants standing density and its dynamics for the vegetative period has shown that in formation of crops there are certain regularities and tendencies. The completeness of barley sprouting in one-specific crops is significantly higher in comparison with their mixed crops.

Formation of plants standing density depends on weather conditions. In droughty year with extreme conditions, the completeness of sprouting decreases.

General tendency of change of plants standing density in the mixed crops of barley and chick-pea is the greatest decrease in quantity of plants on unit of area during the interphase period «sprouting – budding» at chick-pea. During the subsequent interphase periods, thinning-out of plants gradually decreases.

Formation of rather wide area of leaves matters for intensity of photosynthesis process that has paramount value for receiving good forages. Formation of rather big area of leaves determines intensity of photosynthesis and level of accumulatio of nutrients by plants.

On average in researches of 2015-2017, the largest area of leaf surface was noted in the option of barley and chick-pea mix at the harvesting in dairy and wax ripeness phase of barley seed – 28,35 thousand m<sup>2</sup>/hectare. Photosynthetic potential of this agrophytocenosis was also the highest - 1,43 million m<sup>2</sup> days/hectare. The area of leaf surface of one-specific crops of barley was – 24,67 thousand.m<sup>2</sup> /hectare at photosynthetic potential value – 1,15 million m<sup>2</sup> days/hectare. The area of leaf surface of the mixed crops of barley and chick-pea at the harvesting in blossoming phase for green forage was 24,43 thousand m<sup>2</sup>/hectare, at photosynthetic potential 1,13 million m<sup>2</sup> days/hectare. With a further growth and development of cultures of agrophytocenosis, the increase in indicators of photosynthetic potential was noted. So, at the harvesting of mix for grain forage at the harvesting in dairy ripeness of barley seed at the photosynthetic potential of 1,19 million m<sup>2</sup> days/hectare, the area of leaf surface has increased 25,68 thousand m<sup>2</sup>/hectare, and at the harvesting of mix in later time (dairy and wax ripeness phase of barley) these indicators have grown to 28,35 thousand m<sup>2</sup>/hectare and 1,43 million m<sup>2</sup>days/hectare respectively.

On average for 3 years, in connection with the reduction of leaf formation of mix components

at the harvesting for forage in full ripeness phase of barley seed, the reduction of leaf surface area to 27,16 thousand m<sup>2</sup>/hectare was noted, and photosynthetic potential-up to 1,35 million m<sup>2</sup>days/hectare. In general, indicators of photosynthetic potential of the mixed crops of barley and chick-pea were high in comparison with indicators of one-specific crops of barley for grain.

Cultivation of mixed seeds of forage crops is important at the increase of collecting fodder protein. According to the researches carried out in different countries even such grain feed crops as barley do not satisfy completely zootechnical norms of animals' food at harvest for monoforage. Its combination with high-proteinaceous components gives real chance to receive highly nourishing and balanced grain feed forage. Long-term scientific and operating experience says that mixed crops of grain feed crops with leguminous are good raw materials for preparation of high-quality forages of the increased nutritiousness. Barley mixes with chick-pea provide grain feed forage rich with protein, with the sufficient sugar content. At the cultivation of barley and chick-pea mix, collecting of protein depends on harvest terms. The sufficient digestible protein content is noted in fodders from mixes harvested at dairy and wax ripeness phase. The content of 1 fodder unit in haylage with digestible protein was 115 g that is 28,6 g higher than at traditional terms of harvest. Many researchers suggest to carry out preparation of haylage from the mixes of one-year crops (barley+chickpea), to carry out harvest by direct combining at dairy and wax ripeness phase. The output of nutrients decreases from 1 hectare in earlier and later terms. Forage nutritiousness decreases as well. According to the three-year data, collecting of dry substance at dairy and wax ripeness phase of barley and chickpea mix in comparison with dairy ripeness of grain increases from 25,1 to 38,9 c/hectare, protein from 371,3 to 494,2 kg/h .

Aim of different cultures cultivation is receiving qualitative product. At the same time, not only physical mass of production, but assessment of their fodder value is of significant importance for the fodder purpose too. As cultures studied by us for fodder purpose were used differently: for green material, grain haylage and fodder, therefore, the efficiency was estimated on fodder units and crude protein content.

On average for 3 years of researches, the option of mix of barley and chick-pea at the harvesting in dairy ripeness phase – 72,78 c/hectare was the most productive on collecting of green material. But on collecting of dry weight this option has conceded to the option of barley and chick-pea mix at the harvesting in dairy and wax ripeness phase: collecting of dry weight was 14,54 against 15,34 c/hectare respectively.

Mixed crops of barley and chick-pea for forage is more productive than one-specific crops of barley for the same type of forage: productivity on grain was 12,81 c/hectare that is more than at one-specific crops for 3,69 c/hectare, and collecting of FU – 17,96 c/hectare that has exceeded value of similar indicator for one-specific crops for 6,21 c/hectare.

Due to the developed weather conditions of the period of vegetation in 2015-2017, average productivity of barley seed was 9,12 c/hectare. It is equal to 11,75 c/hectare in fodder units. Output of protein was 1,16 c/hectare. At metabolic energy equal to 10,77 GJ/hectare, security of fodder units with protein in barley seed was 108,1 gr (table 1).

Table 1 – Efficiency of mixed crops of barley and chick-pea at different terms of harvesting, average for 2015-2017

Test options	Grain, c/hectare				Green material, c/hectare			
	2015	2016	2017	verage	2015	2016	2017	verage
1	2	3	4	5	6	7	8	9
Barley for forage (control)	6,85	12,35	8,15	9,12	-	-	-	-
Barley + chick-pea (harvesting at the beginning of chick-pea blossoming for green forage)	-	-	-	-	64,12	75,25	68,15	69,17
Barley + chick-pea (harvesting in dairy ripeness of barley for haylage)	-	-	-	-	68,05	78,14	72,15	72,78

continuation of table 2

1	2	3	4	5	6	7	8	9
Barley + chick-pea (harvesting in dairy and wax ripeness of barley for grain haylage)	-	-	-	-	59,44	70,44	64,20	64,69
Barley + chick-pea (harvesting in full ripeness of barley for forage)	9,14	18,85	10,45	12,81	-	-	-	-
LSD <sub>05</sub> c/hectare	1,95	1,81	0,90					

The fodder value of crops was estimated on the collecting of protein and metabolic energy from 1 hectare. 2,20 c/hectare of protein have been received (at one-specific crops of barley for forage – 1,04 c/hectare less: 1,16 c/hectare) on average for 2015-2017 in the option of harvesting of barley and chick-pea mix for forage.

The comparable value on this indicator is noted in the option of barley and chick-pea mix for grain haylage at the harvesting in dairy and wax ripeness phase of grain 2,12 c/hectare.

The highest collecting of metabolic energy in researches is received at harvesting of mixed crops of barley and chick-pea in full ripeness phase – 16,09 GJ/hectare.

Fodder value of one-specific crops of barley was characterized: 1,16 c/hectare of crude protein, 10,77 GJ/hectare of metabolic energy (table 2).

Table 2 – Fodder value of mixed crops of barley and chick-pea at different terms of harvesting, average for 2015-2017

Test options	Dry weight, c/hectare	FU, c/hectare	Crude protein, c/hectare	Security with protein 1 FU, gr	Metabolic energy, GJ/hectare
Barley for forage (control)	-	11,75	1,16	108,1	10,77
Barley + chick-pea (harvesting at the beginning of chick-pea blossoming for green forage)	12,52	11,40	2,21	194,1	11,00
Barley + chick-pea (harvesting in dairy ripeness of barley for grain haylage)	14,54	13,87	2,07	148,9	13,25
Barley + chick-pea (harvesting in dairy and wax ripeness of barley for grain haylage)	15,34	14,93	2,12	142,3	14,69
Barley + chick-pea (harvesting in full ripeness of barley for forage)	-	17,96	2,20	138,2	16,09

**Conclusion.** Thus, application of mixed crops of barley and chick-pea is an important reserve of production of own forages in the conditions of feeding complexes and industrial type farms, at the same time, it is possible to use this mix both for production of green forage, and for providing agricultural animals with haylage and fodder weight.

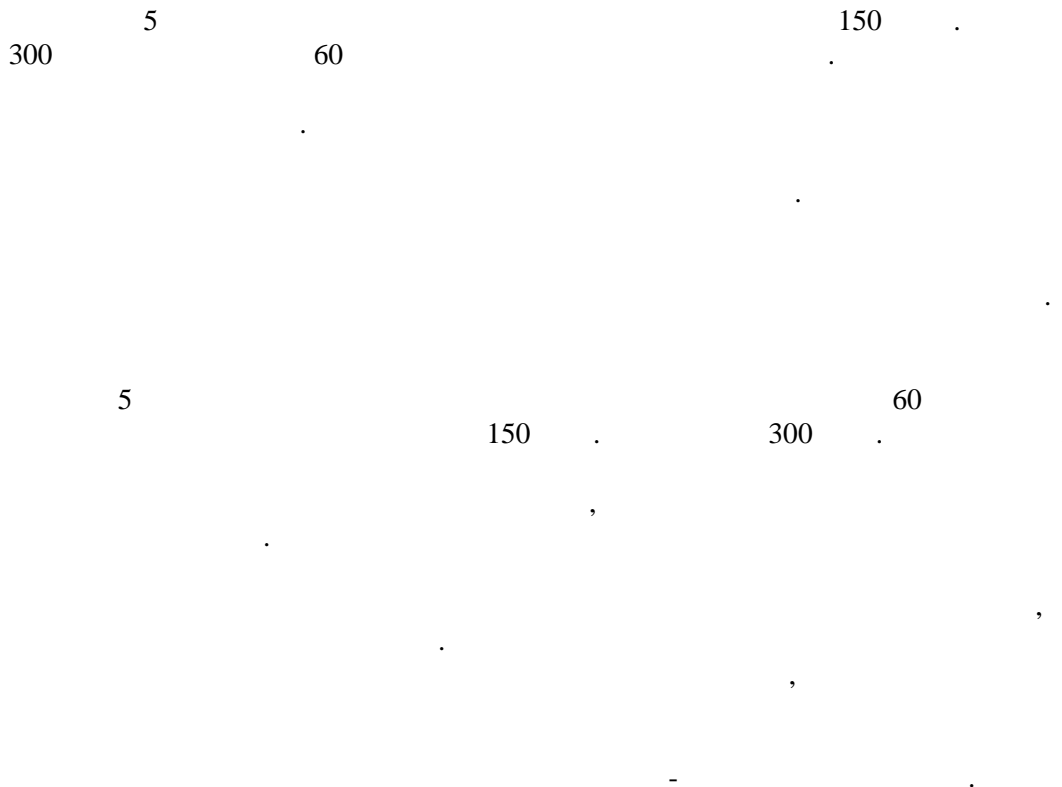
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