Optimization of the Colza Seeding for Oil Seeds in the Conditions of Steppe Zone in Northern Kazakhstan

[1]Gulzhanar Shaihina, [2]Abilzhan Husainov

Research institute of environment and stable development,
Kokshe Academy, Kokshetau, Kazakhstan
[1]gula.13@mail.ru, [2]abil_tokan@mail.ru

Abstract: *A potential of colza productivity in connection with seeding norms influence was found out for the first time in the steppe zone of North Kazakhstan. It was stated that optimal combination of elements of colza cultivation technology provides getting high seed production with less expenses for production unit.*

Keywords: *colza, seeding norm, plant population, phenological stage, field germination rate, crop productivity.*

1. INTRODUCTION

Colza seeds is an important source of getting cheap oil and high protein feeding stuff. They contain 40-44 % of oil, 18-22 % of protein, 6-7 % of cellulose and 24-25 % of non-extract substances. With colza seeds crops productivity of 01 t/ha fat output is 0, 41-0, 44 tons and protein about 0,2 tons [1]. Fast growth of demand for oil for food and also high-protein oil meal to feed the cattle and poultry nowadays has led to sharp increase in oil crops manufacture. Success in selection contributed to it. Colza and rape were created with very low content of erucic acid and glucosinolate owing to which obstacles for using oil for human food and oil meal to feed cattle and poultry were removed. Colza oil is referred to nutritive products. Naturally it is used as oil for salads, in the composition of cooking oil and margarine and also for technical purposes. Non erucic colza kinds of oil os close to olive oil. It is very good for health. Non erucic colza oils contain significant amount of glyceride of unsaturated fat acids. They have a significant characteristics such as decreasing the possibility of thrombosis formation in the organism and decreasing and controlling cholester in contents in the blood.

Increasing colza seeds production in North Kazakhstan will contribute to satisfaction of growing demand for more qualitative oil fats and animal feed industry for oil cakes [2]. Oil cakes made of colza seeds contain 40 % of protein which allows to balance 10 tons of compound animal feeding stuff with 1 ton of oil cakes with protein. Colza provides high protein green material during the earliest and latest periods of feeding animals [3].

Strategy of the Republic of Kazakhstan development till 2050 makes it an important issue to provide the population with food and the issue of grocery safety of the country on the basis of development and implementation into manufacture scientifically grounded recommendations and offers on the rational use of natural resources. Thus there is a special interest to the study of the technology of cultivation and manufacture of colza, which is valuable as high-protein culture [4].

Kazakhstan has all the possibilities (natural-climatic, sorts of intensive technologies) to provide the population and industry completely with oil and cattle breeding with high-protein food. In this connection a very important source of supplementing oil and feed protein resources is colza which is a valuable oil and feeding culture.

Colza is important for North Kazakhstan as oil and feeding culture and has great economic significance. Possessing a number of valuable characteristics, such as wide ecological adaptiveness, cold endurance, early ripeness, a lot of hay cutting, high feeding and seeds productivity, which profitably distinguish it from many agricultural crops. So it should take a worthy place among the structures of cultivated areas in North Kazakhstan.

In steppe farming colza crops can be used to protect soil from water and wind erosion, sideration, struggle with weedery. In crop rotation system it is a good predecessor for most agricultural crops.

Colza production expansion is held by its cultivation technology imperfection. There is not enough research in this area. Thus, this fact has stipulated the basis to choose the direction of the research.

2. METHODS

2.1. Scientific Novelty

Main elements of colza cultivation for oil seeds were studied for the first time in the conditions of usual black soils of North Kazakhstan at aridity zone. The influence of seeding norms on crops producing capacity and colza products quality on oil seeds were studied. **Practical significance.** Received results allowed to find out the necessary data about biological peculiarities of colza growth and development at various seeding norms. Research results use in manufacture conditions will allow the farms, located at black soils of North Kazakhstan solve the problems of getting nutritive, technical and feeding products with less expenses for a unit of the product.

The goal of the research is to develop cultivating technology of colza for oil seeds for bioclimatic conditions of steppe zone of North Kazakhstan.

Objectives of the research included:

1. Study seeding norms influence on colza plant population.

2. Study seeding norms influence on colza phenological stage development.

3. Study seeding norms influence on colza crops productivity.

2.2. Objects, Conditions and Research Methods

One of the main conditions of receiving high seeds and green material productivity is correct choice of seeding norm. The amount of nutrients, moisture and light depend on plant population. Satubaldin K.K. points out that with seeding norm of 1 million with various row spacing the number of seeds in a colza legume fluctuated from 17,2 to 18,4 pieces, with increasing the norm twice – from 17,6 to 19,9, with seeding norm of 3 million – 17,1-18,0, 4 million – 17,1-17,9 and 5 million – 17,0-18,1 pieces. Optimal area formation of plants nutrition by changing the width of the row spacing has shown that spaced plants contribute to active seed formation. Thus with row way of seeding with row spacing of 15 cm with colza norm of 1 million of fertile seeds for a hector there were 42,6 legumes on one plant, with row spacing of 30 cm – 1,2 times more, 45 cm – 1,9 times more and 60 cm – 2,3 times more [5].

In Dolnikov I.M. and Dolnikova Z.M. research while increasing colza seeding norm from 3 to 4 million seeds for a hector crops productivity reduced for 3,2-3,5 center per hector [6].

Siberian department of Lenin All-Union Academy of agricultural sciences scholars Geidebreht I.P., Gof V.F. and Milashchenko N.Z. state that the optimal number of plants per 1 square meter is 130-150 pieces. With field germination rate within 50 % it is necessary to seed up to 3 million fertile seeds for 1 hector. Seeds harvest did not increase with higher norms of colza seeding in the tests of Siberian bearing crops station. It is recommended to plant 3 million of fertile seeds on all the zones for feeding and seeds. Canadian specialists consider one of colza cultivation peculiarities is its dependence of crops producing capacity of seeding norms. As observation has shown, separate plants tend to branch and legumes with seeds are located in the lower part of the plant with partly stocked seeding. At thick seeding especially in drought conditions as a result of competition there are less legumes with a plant and they are rather small [7, 8].

Experimental research was conducted during the period of 2004 and 2006 at Stepnoishimskaya experimental station (Leonidovka village). Colza seeding norms for oil seeds was conducted at the field test according to the following scheme:

1 million

2 million

3 million

4 million

Test replication is 4-tuple. Blockareais 144 m^2, accounting area is 50 m^2.

Soil is ordinary black carbon-bearing soil medium deep hard argillaceous sand.

3. RESULTS AND DISCUSSION

Before seeding of this test accessible deposit of moisture was average 58,5 to 62,6 mm for 3 years in the layer of 0-50 cm, 93,6-108,2 mm one meter soil layer that correspond to satisfactory moisture deposits according to Neklyudov A.F table (Table 1) [9].

Table1. *Deposits of accessible moisture of soil under colza at black soils of North Kazakhstan (2004-2006).*

Seeding norm, mln/ha	Before seeding		Before harvesting	
	Soil layer, cm			
	0-50	0-100	0-50	0-100
0,5 mln	59,9	107,1	42,7	79,4
1 mln	58,9	108,2	43,3	78,1
2 mln	58,9	93,6	41,8	78,3
3 mln	62,6	108,1	42,3	77,8
4 mln	58,5	107,2	45,9	82,0

This fact allowed to evaluate the efficiency of different seeding norms more efficiently. General decrease of soil moisture deposits is observed before harvesting period, when colza plants, having spent all accessible moisture resources begin to accumulate dry substance and seeds mature growth. At this time accessible moisture deposits in a meter layer were 82, 0-77, 8 mm. The least deposit of soil moisture before harvesting was noted in 2006, which was 87, 5-50, 3 mm, the most – in 2005, which is connected with great precipitation during vegetation period (63, 2-47, 4mm).

Plant population for a unit of area plays the most important role in receiving high harvest (Table 2).

Table2. *Colza plant population during the phase of complete germination (2004-2006)*

0,5	98,0	49
1 mln	95,5	96
2 mln	77,2	14
3 mln	99,3	298
4 mln	87,0	348

The most important characteristics, having significant influence on the formation of plant population, is seeds field germination rate.

Account of complete germinating seedling has shown that with the increase of seeding norm from 0,5mln to 4 mln plant population increased correspondingly from 49 to 348 pieces per square meter.

Analyzing table 3 data it can be noted that seeding norms practically did not influence crops infestation. In the phase of rose-knot linear coefficient of the connection of seeding norm with crops infestation (correlation coefficient) was only r=0.17±0.24. By the end of vegetation the number of weeds generally increased 1,5-2,8 times in all variants, but the connection between seeding density and weed infestation was not specified. This is connected with the fact that colza practically does not compete and does not suppress weed development.

Table3. *Colza crops infestation depending on seeding norms, pieces per 1 square meter (2004-2006)*

Weeds	0,5 mln	1 mln	2 mln	3 mln	4 mln
Before seeding					
Perennial total	4,81	5,97	1,53	6,1	6,27
Annual plants	3,17	0,90	2,7	5,23	3,17
Bilobate	1,84	2,70	0,57	1,07	0,17
Total	10,38	9,87	4,97	13,57	9,78
Before harvesting					
Perennial total	5,64	5,53	3,40	8,37	5,37
Annual plants	9,17	13,27	6,97	8,03	8,13
Bilobate	3,26	6,5	1,70	3,83	3,2
Total	19,26	26,37	13,67	20,23	18,57

Research results on revealing optimal seeding norm have shown that the most productivity is provided by colza with seeding norm of 1, 0 million. With further increase of the norm the harvest is decreased. Thick crops had less legumes and they were smaller that led to harvest shortfall. For 3 years in average crops productive capacity at variants 2-4 million was 0, 38-0,64 t/ha or 4-67,2 % lower.

Thus, the research has shown that colza forms the harvest more stable with seeding norm of 1 million fertile seeds. Norm exceeding contributes to crops overcrowding which negatively influences the structure of the harvest, quality of seeds and as a result crops producing power. In our tests with the variants of seeding norm of 3-4 million/ha crop producing capacity was 3 times lower than optimal variant.

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AUTHORS' BIOGRAPHY

Shaihina Gulzhanar was born in 1981 in Kokshetau. Graduated from Kokshetau state university named Ualihanov in 2003, has graduated a master program in Chemistry in 2005. Since 2003 to 2010 has worked as a senior lecturer at "Ecology" department at Kokshetau state university. From 2007 to 2012 she has studied at Tyumen state agricultural academy. Since January 2012 she was appointed a vice-rectoronup-bringing and social work at «Kokshe" Academy.

Abilzhan Husainov has started his career as a junior research assistant at feed production manufacture in 1973. Has worked in many positions starting from senior lecturer to vie-rector at Kokshetau state university named after Ualihanov from 1996 to 2008. From 2008 till the present moment is working in the position of the head of department of soil science, agro chemistry and forestry at Kokshetau academy.