BUCKWHEAT IN ALTAI: AREA AND PRODUCTIVITY

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The buckwheat crop areas in the Altai region in 2011 (422.2 thousand hectares) were located unevenly: the foothills of the Salair - 35%, the foothills of the Altai - 26%, the forest-steppe by the Ob - 19%, the Alei steppe - 15%, the Kulunda steppe - 5%. The crop productivity of buckwheat varied greatly as well, from 0.51 t/ha (the steppe zone) to 0.93 t/ha (the foothills). Low productivity does not allow increasing the production of grain to the required amount. The increase can be achieved through ordering the placement of crops according to the natural zones as well as through improving the agricultural technology, which will raise the yield of grain in the steppe to 1.84 t/ha. It includes the following measures: introduction of sowing $N_{30}P_{30}K_{30;}$ time of buckwheat sowing in early June in a wide method (0.45 m) by the norm of 3.5 million sprouting seeds per 1 ha; foliar feeding in early budding in combination with pollination and re-pollination.

Keywords: *buckwheat, Altai, crop areas, yield, agricultural technology.*

Introduction

The Altai region of Russia is the leading producer of buckwheat grain (*Fagopyrum esculentum* Moench). Sowing of this crop in 2011 in the Altai region occupied 422.2 thousand hectares, which is more than 40% of the sown area of buckwheat in the country [1]. Taking into consideration minimum norms of per capita consumption of buckwheat 3.0-3.5 kg per year, the production of buckwheat in Russia should be about 0.9-1.0 million tons, including the necessary seed funds [2]. Currently, however, the production of buckwheat is significantly behind these figures. In Altai the main crop areas are concentrated in the forest-steppe and foothills (80%), but the yield of buckwheat is low – 0.85 t/ha. Therefore, to increase the production of grain the farms have been expanding the acreage, which contradicts the system of agriculture. Individual elements of the agricultural technology of buckwheat do not meet zoning features, consequently do not increase yields.

The relevance of research

The placement of buckwheat acreage through Altai without agrobiological requirements to the habitat as well as imperfection of individual methods of agricultural technology is constraining the growth scale of the grain production. In this regard, the analysis of the spatial distribution

of buckwheat crops as well as improving agricultural practices of cultivation is considered urgent.

Subject and methods

To systematize crop areas and yields of buckwheat the data of Altai Regional Division of the Federal State Statistics Service [1] are used. The experimental data presented in this paper were obtained on the basis of the field research, in which the author was directly involved. The field research was conducted in 2009-2012 in the Tselinny district, located in the forest-steppe of the Altai region. The object of the research was the buckwheat variety Dikul. The experimental procedures included the study of fertilizers, timing and methods of sowing, seeding and pollination norms. The site soil tested was represented by leached humus. Humus content in the plowing horizon was 5-6%. The area of the accounted plots was 18 and 64 m², 4-time repeated study; recording and observation were common in agriculture and plant cultivation.

Results and discussion

The largest crop areas of buckwheat in Altai in 2011 were located in the forest-steppe foothills of the Salair (35%), where the best of soil and meteorological parameters for the crop were recorded. Then follow, in descending order: the foothills of the Altai (26%), the forest-steppe by the Ob (19%) and the Alei steppe (15%). The minimum areas are sown by buckwheat in the arid Kulunda steppe (5%) (Table 1) [1].

Table 1

The crop area and the yield of buckwheat in the Altai region in 2011

Natural zone	Acreage		Crop yield (t/ ha)	
	thousand ha	%	(t/ ha)	dev. (+,-)
the Kulunda steppe	19.8	5	0.51	- 0.22
the Alei steppe	63.1	15	0.58	- 0.15
the forest-steppe by the Ob	82.2	19	0.75	+ 0.02
the forest-steppe foothills of the Salair	147.1	35	0.86	+0.13
the foothills of the Altay	110.0	26	0.93	+ 0.20
Total in the Altay Region	422.2	100	0.73	0

The grain yield is a general indicator summing contribution of technological and natural factors in its formation [2, 3, 4]. Analyzing the yield of buckwheat recorded in 2011 it should be mentioned that it varied significantly – from 0.51 t/ha (the Kulunda steppe) to 0.93 t/ha (the foothills of the Altai) (see Table 1). The variation of the yield is 45%. The fact makes us insist on the need for a careful approach to the study of the feasibility of this crop sowing placement within the natural areas.

In 2007-2011 the dynamics of both in time and in space was not recorded within the area under buckwheat in Altai. From 2007 to 2009 the crops were declined; from 2010 they were increased, more in the steppes than in the foothills. The following figures can be presented: in 2007 – 390.5 thousand hectares; in 2008 – 340.2; in 2009 – 285.0; in 2010 – 341.3 and in 2011 – 422.2 thousand ha [1]. The largest sown area which is typical for the forest-steppe in the foothills of the Salair varied the least - from 111.9 thousand hectares (2009) to 147.1 thousand ha (2011), i.e. by 19%.

In the foothills of the Altai these figures are somewhat different - from 79.5 thousand hectares (2009) to 110.0 hectares (2011), the change in the area has increased to 28%. In the forest-steppe by the Ob the acreage dynamics is as follows: in 2009 the crops were minimal – 45.0 thousand ha; in 2011 were the maximum (82.2 hectares). The deviation is 45%. The crops of buckwheat in the Alei steppe were not so big as in the above-mentioned natural areas, in 2009 they occupied the smallest area – 38.6 thousand hectares; in 2011 the biggest – 63.1 hectares, the deviation was 39%.

The Kulunda steppe can be defined as an ineffective natural zone of the region as for the buckwheat production. This is indicated by the area under sowing and the yearly dynamics. In 2009 the crop had a minimal productivity – 10.0 thousand ha; in 2011 it increased to the maximum of the zone – 19.8 thousand ha, with a deviation of almost 50%.

Thus, the 5-year (2007-2011) analysis of the acreage placement of buckwheat in the Altai region demonstrates the need for its concentration in the forest-steppe and the foothills of the natural zones.

The yield of buckwheat for the period in question does not also have a clear year dynamics [1, 4]. The maximum rates in the average for the region (0.95 t/ha) were obtained in 2009, the lowest (0.63 t/ha) - in 2008; in other years the average yield ranged from 0.65 to 0.73 t/ha. The best buckwheat yield was recorded in the foothills of the Altai: 2007 – 0.74 t/ha; in 2008 – 0.83; 2009 – 1.19; 2010 – 0.88 and 2011 – 0.93 t/ha; the average for 5 years is 0.91 t/ha. Slightly lower figures were recorded in the forest-steppes foothills of the Salair: 2007 – 0.67 t/ha; in 2008 – 0.72; 2009 – 0.89; 2010 – 0.66 and 2011 – 0.86 t/ha. The average for 5 years is 0.76 t/ha. The position of the forest-steppe by the Ob in terms of grain yield occupies a middle line between the foothills and the steppe. The yields in the area are as follows: in 2007 – 0.76 t/ha; in 2008 – 0.67; in 2009 – 0.79; in 2010 – 0.56 and in 2011 – 0.75 t/ha. The average for 5 years is 0.71 t/ha. The Alei steppe is characterized by a low productivity of buckwheat: 2007 – 0.69 t/ha; in 2008 – 0.49; in 2009 – 0.93; 2010 – 0.70 and 2011 – 0.58 t/ha. The average for 5 years is 0.68 t/ha.

The minimum yield data for buckwheat in Altai are typical for the dry Kulunda steppe: in 2007 – 0.63 t/ha; in 2008 – 0.45; in 2009 – 0.97; in 2010 – 0.45 and in 2011 – 0.51 t/ha. The average for 5 years is 0.60 t/ha.

Based on the above data it can be concluded that the yield of buckwheat in different natural zones in the Altai is extremely unstable. The fluctuations in grain yield in different years and natural zones are multiple (almost 3 times) - from 1.19 t/ha in the foothills of the Altai (2009) to 0.45 t/ha in the Kulunda steppe (2008, 2010). This is connected with dryland conditions, agricultural technology imperfections and most of all with biological causes, i.e. underpollination of buckwheat flowers [4].

Buckwheat is very sensitive to weather conditions. The moisture content of the surface layer of the atmosphere plays an important role in the photosynthetic activity of crops [3, 5, 6]. Good natural moisture conditions and fertile soils are characteristic of the forest-steppe zones of the region. Therefore it will be the most appropriate to plant buckwheat here, keeping the structure of crop rotation. The steppe zones of the region (Kulunda and Alei), due to lack of natural moisture, are less suitable for the cultivation of this crop.

Our research has shown that on the average for 2009-2011 the yield increase through the experiments with fertilizers has changed significantly. The maximum figuers were recorded through double norms of the fertilizers $N_{60}P_{60}K_{60}$ (NPK_2) for all study periods of sowing the buckwheat - from 0.17 to 0.54 t/ha (21 and 68%). However, yield increase did not pay off increased material costs. Therefore, the norm of the fertilizer $N_{30}P_{30}K_{30}$ (NPK_1) can be considered to be more efficient. The grain yield was 0.95 – 1.30 t/ha.

The research of sowing the buckwheat showed that the best yield increase was obtained by sowing on the 5^{th}-10^{th} June – 0.27-0.54 t/ha (34-68%) depending on the norm of fertilizers. Other timing is not advisable. The reliable yield increase of buckwheat on the best fertilizer NPK_1 in this case reaches the maximum – 0.51 t/ha, with the average yield of 1.30 t/ha.

Analyzing the effectiveness of rows for the research years (2009-2011), the advantage in wide method of buckwheat sowing (0.45 m) can be noted for all the studied seeding rates. On these options the highest yield increase - from 0.22 to 0.38 t/ha (21-36%) was recorded. The average yield was obtained at 1.26 – 1.42 t/ha, for years it varied significantly due to the current weather conditions - from 1.08 t/ha (in 2010) to 1.69 t/ha (in 2011).

The study of buckwheat sowing led us the conclusion of the benefits of an amount of 3.5 million sprouting seeds per 1 ha in all the studied methods of sowing. The crop growth figures are as follows: 2.5 million seeds - from 0.13 to 0.22 t/ha (12-21%); 3.5 million seeds - from 0.16 to 0.38 t/ha (15-36%); 4.5 million seeds - from 0.09 to 0.24 t/ha (9-23%). Thus, the study results

are showing high productivity of wide-row sowing buckwheat (0.45 m) by 3.5 million sprouting seeds per 1 ha, where the best grain yield can be achieved 1.42 t/ha.

Foliar feeding is also an important element of agricultural technology, as the grain yield through the experiments with high fertilizing during pollination is high and within the years of research (2010-2012) ranged from 1.21 to 2.16 t/ha [4]. The best yield was obtained by feeding in the early bud stage –1.65-1.84 t/ha depending on the pollination. The variants without fertilization had less, and at the same time, contrasting yield – from 0.29 t/ha to 1.43-1.47 t/ha in units with pollination.

The surveys showed that without pollination by honeybees the buckwheat yield did not exceed more than 0.46 t/ha. The pollination by bees increased the yield of grain to 1.65-1.71 t/ha, a joint pollination and re-pollination increased the productivity –1.84-1.89 t/ha.

Conclusion

An important source for increasing the buckwheat production in the Altai region is to regulate the spatial distribution of crops according to the natural zones as well as the improvement of agricultural technology.

References

1. Information of AltayKrayStat. – Vol. 22-16. – 11/20/2012. – 3 p.

2. Fesenko A.N. The production of buckwheat in Russia: state and prospects / A.N. Fesenko, G.E. Martynenko, S.N. Selikhov // Agriculture. – 2012. – Vol. 5. - P. 12-14.

3. Vazhov V.M. Some indicators of photosynthesis in field crops in the Biysk forest-steppe / V.M. Vazhov // Success of modern science. – 2012. – Vol. 11. – P. 92-94.

4. Vazhov V.M. Efficiency of fertilizing and pollination of buckwheat in the Altai steppe / V.M. Vazhov // Agriculture. – 2013. – Vol. 1. – P. 35-36.

5. Kuznetsova N.V. Photosynthetic activity of beet crops on irrigated light areas of the Lower Volga region / N.V. Kuznetsova, N.E. Stepanova // Proceedings of Lower Volga agro-university complex: science and higher education. – 2011. – Vol. 1. – P. 36-42.

6. Kuznetsova N.V. Ecological justification of rain clouds distribution at watering by wide wheeled sprinkling machine (DKSH-64) / N.V. Kuznetsova, L.N. Makovkin, N.E. Stepanova // Proceedings of Lower Volga agro-university complex: science and higher education. – 2012. – Vol. 4. – P. 30-35.