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PRODUCTIVITY AND FEED VALUE OF WINTER RYE

Abstract

The productivity of livestock farming depends to a large extent on the provision of high quality fodder. Winter rye plays an important role in creating a strong fodder base. Winter rye has a number of advantages over other crops. Chief among them is its ecological plasticity and relatively undemanding growing conditions. It grows successfully and generates high yields in a vast area with comparatively low natural resource endowment and unfavourable growth and development factors for winter cereal crops. In addition, winter rye is a good precursor for many crops. Cultivating winter rye helps to relieve peak loads on the machine-tractor fleet and farm workforce and thereby reduce costs.

Winter rye is the earliest fodder for livestock in spring, so it is often the first crop in the green belt and helps prevent the development of avitaminosis in animals in early spring. Rye green matter is highly eaten by animals and can be used about 2 weeks earlier than perennial grasses. Rye is mowed for green matter during the «emergence-beating» period. Rye provides green matter for grazing cattle and horses and in late autumn when frost sets in.

***Keywords**: rye, yield, quality, viscosity, pentosans.*

Introduction. The productivity of animal husbandry largely depends on the availability of high-quality feed. Winter rye plays an important role in creating a solid feed base. Winter rye has a number of advantages over other cereals. The main of them is ecological plasticity and relatively undemanding to the growing conditions. It successfully grows and forms a high yield on a vast territory with a relatively low supply of natural resources and unfavorable factors for the growth and development of winter grain crops. In addition, winter rye is a good precursor for many crops. The cultivation of winter rye allows to relieve the peak loads on the machine and tractor fleet and the working forces of the farm and thereby reduce costs

Winter rye is the earliest food in the spring for farm animals, so it is often the first crop in the green conveyor and allows to prevent the development of avitaminosis in animals in early spring. The consumption of the green mass of rye by animals is very high and it can be used about 2 weeks earlier than the crops of perennial grasses. On the green mass, it is mowed during the «exit into the tube-earing» period. The rye gives the green mass for herding cattle and horses, and in the late autumn when the onset of cold weather.

Rye grain is characterized by a high content of a number of valuable nutrients, in particular, the essential amino acid lysine (4.3g/kg). It is recommended to introduce rye grain in the diet of cattle no more than 30 % and pigs-10 %. This is due to the relatively low digestibility of rye grain nutrients by animals, due to the content of anti-nutrients in the grain, in particular, pentosans [2].

The purpose and objectives of the study. Taking into account the lack of information in the scientific literature, we conducted a study of the productivity of green mass and feed properties of rye

grain in different contrasting natural conditions. Based on the purpose of the study, the following tasks were set: to determine the aboveground mass of plants in different phases of plant growth and development and the content of raw protein in it, to determine the yield and feed properties of winter rye grain.

Materials and methods of research. The productivity and grain quality of the zoned winter rye varieties Saratovskaya 5 (Ural region, Republic of Kazakhstan) and Chulpan 7 (Republic of Bashkortostan, Russian Federation) were studied. Field experiments were conducted in the experimental field of Institute of West-Kazakhstan agrarian-technical University and UC Bashkir state agrarian University. The climate of the Ural region is arid, with an average of 324 mm of precipitation per year. The southern forest-steppe of the Republic of Bashkortostan is characterized by relatively favorable conditions for moisture availability for winter rye. The total precipitation in this zone is 452 mm. The spring vegetation period of winter rye in 2019, both in the Ural region and in the Republic of Bashkortostan, was acutely arid. Thus, atmospheric precipitation for April and May fell in the Uralsk region only 17.2 mm (average annual 40.0 mm), and the average temperature was 14.8 oC (average annual 11.9 oC).

The size of the plots in the experiments is 60 m^2 in three-fold repetition. The seeding rate in the experiments of the research Institute of the West Kazakhstan agrarian-technical University was 3 million units/ha and in Bashkir GAU – 5 million units/ha. The leaf area was determined by die-cutting. Accounting for the green mass of plants was carried out on trial sites with a size of 1 m2 in three places of the plot, accounting for grain yield – by the method of continuous threshing with Wintersheiger and Tirra combines. The elements of the crop structure were determined in test sheaves, the mass of 1000 grains - according to GOST 10842-89.

In the laboratory of biochemical analysis and Biotechnology of the Bashkir State Agrarian University, the grain quality was analyzed. Starch was determined by the polarimetric method, the content of crude protein was calculated by multiplying the nitrogen content by the corresponding factor to rye, the content of phosphorus – vanadium-molybdenum method, potassium and sodium – flame photometric method, calcium – trigonometric method fluorescent, water-soluble pentosans – orcinol-chloride method according to Albaum and Umbreit modified Hashimoto [4], the kinematic viscosity of an aqueous extract of the grain – viscometer VPG-1.

Research results and discussion. Climatic conditions have had a significant impact on the productivity of winter rye. The aboveground biomass of winter rye plants in the tubulation phase in the arid climate of the Ural region of Kazakhstan was 2.6 t / ha, and in the southern forest – steppe of the Republic of Bashkortostan-4.8 t / ha. There was a difference in plant height and leaf area of winter rye crops (Table 1). At the same time, the largest aboveground dry biomass of winter rye plants was formed by the phase of waxy grain ripeness. So, in the conditions of the Bashkir GAU UNC, it was 7.6 t / ha. However, the maximum content of crude protein in the dry mass of plants was in the tubulation phase (23.9%). Subsequently, the value of this indicator naturally decreased. In the earing phase, it was 15.4%, flowering-12.5%, grain formation-10.8% and in the phase of milk ripeness of grain-9.7%.

Table 1 - Yield of green mass and grain of winter rye

Indicators	Experimental field SRI WKRTU	ERC Bashkir SAU
Plant height (tubulation phase), cm	20	27
Leaf area (tubulation phase), thousand m^2 / ha	14	28
Yield of green mass (tubing phase), t / ha	2,6	4,8
Grain yield, t / ha	1,04	3,41
Number of plants, pcs./m^2	91	237
Number of productive stems, pcs./m^2	134	393
Number of grains per ear, pcs.	27	28
Weight of 1000 grains, g	31,8	31,2

The yield of winter rye grain in the conditions of the southern forest-steppe of the Republic of Bashkortostan was formed much higher (3.41 t / ha) than in the steppe zone of the Uralsk region of Kazakhstan (1.04 t/ha). Analysis of the structure of the crop shows that different yield in the experiments due to plant density and density of productive stalks, and the number of grains per spike

(table 1). It should be noted that a small density of plants was formed in the Experimental Field of the Research Institute of the West Kazakhstan ATU, except for soil and climatic conditions, and due to a lower seeding rate.

Laboratory analysis showed that the grain of winter rye grown in the conditions of the Bashkir State Agricultural University contains 58.3% starch, 10.60 % crude protein, 0.19 % phosphorus, 0.411% potassium and 0.109 % sodium, 0.110% calcium.

Water-soluble pentosans contained in rye grains reduce the digestibility of feed and, as a result, the growth and productivity of animals, especially poultry [3]. Laboratory studies conducted by us show that winter rye grain has a relatively high content of water-soluble pentosans. Thus, in the grain of the Chulpan 7 variety grown in the conditions of the forest-steppe of the Republic of Bashkortostan, the content of water-soluble pentosans was 2.30 %. An indirect indicator of the content of water-soluble pentosans in the grain and, accordingly, the feed properties of winter rye grain is the viscosity of the water extract [1]. The value of this indicator was relatively high and in the grain of the Chulpan 7 variety was 72.66 cCt.

Conclusions. Winter rye forms a fairly high green mass in early summer and is one of the first crops in the green conveyor. In the tubulation phase, the winter rye biomass is richer in crude protein than in the subsequent growth and development phases. Rye grain is not inferior to the grain of a number of other bluegrass crops in terms of protein and mineral content. At the same time, water-soluble pentosans, which are relatively high in quantity, significantly reduce the feed value of winter rye grain.

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ТҮЙІН

Мал шаруашылығының өнімділігі көбінесе жоғары сапалы азықпен қамтамасыз етілуімен байланысты болып келеді. Сондықтанда азықпен база құруда күздік қара бидай негізгі орын алады. Басқа астық дақылдарына қарағанда күздік қара бидайдың болашағы мол. Бұл дақыл экологиялық жағынан таза және өсіп өніуі үшін талғамсыз дақыл болып келеді. Жақсы өсіп, жоғары өнімділік құрып, табиғи ресурстарға кедей жерлерде де өсіп-дамып, қолайсыз факторларға тұрақты болып келеді. Бұдан басқа күздік қара бидай көптеген дақылдарға жақсы алғы дақыл бола алады. Бұны өсіруде шаруашылыққа аз күш жұмсап, шығын көлемін азайтуға мүмкіндік туғызады.

Күздік қара бидай ауыл шаруашылығы малдарына өте ерте көктемгі азық, сондықтанда жасыл азық үшін бұл бірінші дақыл болып есептеледі. Малдарға жасыл азығының желінгіштігі өте жоғары және оны басқа көпжылдық шөптерге қарағанда екі жұма бұрын қолдануға болады. Жасыл азыққа оны түтік шығару – масақтану кезеңінде шабады. Күздік қара бидайдың жасыл азығы мүйізді ірі қара мен жылқы малдарына көктемде және күзде жақсы жайылым ретінде қолданылады.

РЕЗЮМЕ

Продуктивность животноводства во многом зависит от обеспеченности высококачественными кормами. В создании прочной кормовой базы важное место занимает озимая рожь. Озимая рожь имеет ряд преимуществ перед другими зерновыми культурами. Главное из них экологическая пластичность и относительно нетребовательность к условиям произрастания. Она успешно произрастает и формирует высокую урожайность на обширной территории со сравнительно низкой обеспеченностью природными ресурсами и неблагоприятными факторами роста и развития озимых зерновых культур. Кроме того,

озимая рожь хороший предшественник для многих культур. Возделывание озимой ржи позволяет разгрузить пиковые нагрузки на машинно-тракторный парк и рабочие силы хозяйства и тем самым сократить затраты.

Озимая рожь самый ранний корм весной для сельскохозяйственных животных, поэтому в зеленом конвейере она часто является первой культурой и позволяет предупредить развитие авитаминоза у животных ранней весной. Поедаемость зеленой массы ржи животными очень высокая и использовать ее можно примерно на 2 недели раньше, чем посевы многолетних трав. На зеленую массу ее скашивают в период «выход в трубку-колошение». Рожь дает зеленую массу для пастьбы крупного рогатого скота и лошадей и поздней осенью при наступлении морозов.

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EFFICIENCY OF CULTIVATION OF POTATO VARIETIES OF DIFFERENT EARLY MATURITY IN THE CONDITIONS OF THE WEST KAZAKHSTAN REGION

Abstract

The importance of the variety has significantly increased in the context of the transition of crop production from chemical-technogenic farming systems based on comprehensive industrialization and chemization to adaptive (ecological-biosphere) systems aimed at preserving and increasing soil fertility and crop yields, based on the creation of sustainable agrobiocenoses that do not violate the natural processes occurring in the biosphere. It is believed that at the current rate of development of agriculture and breeding, the contribution of the variety to the further growth of potato productivity will continuously increase and reach 60-80%. In this regard, one of the most pressing problems in potato growing is the economic, biological and economic assessment of each variety cultivated in production.

We have made an economic assessment according to three groups of indicators: all types of material and monetary costs (expenditure part); output of products in kind and value forms (income part); indicators of economic efficiency, which serve as the basis for an objective assessment of the advantages or disadvantages of a particular variety. The general indicators of economic efficiency are the net income per unit of planting area, the cost of a unit of production, and the level of profitability. The expenditure part includes labor costs with deductions, the cost of seeds, the cost of their preparation, fertilizers, plant protection products, the maintenance of fixed assets, including the cost of fuel, amortization, general economic expenses and other costs. Economic calculations have shown that the efficiency of potato cultivation largely depends on the variety.

Keywords*: potatoes, sorts, different early maturity, economic efficiency, energy assessment.*

Introduction. To intensify potato growing in the West Kazakhstan region, it is necessary to use such varieties that, along with valuable economic characteristics, would have high resistance to heat and drought. Without this, any variety here has no practical significance. Unfortunately, it is very difficult to find varieties that are resistant to heat and drought. And, if the fight against drought is carried out by irrigation, then with the heat it is more difficult.

Climatic and weather conditions of the West Kazakhstan region (long summer with frequent droughts and dry winds, with high temperatures and low relative humidity) promotes the degeneration of potatoes. This process is greatly enhanced when the seed material is infected with numerous