http://www.moderntechno.de/index.php/meit/article/view/meit16-02-089
DOI: 10.30890/2567-5273.2021-16-02-089

UDC 631.11 / 14 "324": 632.938: 631.53.04

ENERGY EFFICIENCY OF USING WINTER TRITICAL FOR GREEN FEED

ЕНЕРГЕТИЧНА ЕФЕКТИВНІСТЬ ВИКОРИСТАННЯ ТРИТИКАЛЕ ОЗИМОГО НА ЗЕЛЕНИЙ КОРМ

Svystunova I. / Свистунова І.
PhD/ к. с.-г. н., доц.
Vaskivskii B. / Васьківський Б.
Student/ студент
National university of life and environmental sciences of Ukraine, Kyiv
Poltoretskyi S. / Полторецький С.
d. a. s., professor/ д. с.-г. н., профессор
Uman national university of horticulture, Uman, Ukraine
Grinchishin O. / Гринчишин О.
Researcher/ н. с.
Ukrainian Institute for Plant Varieties Examination, Kiev
Rebezov M. / Ребезов М.
d. a. s., professor / д. с.-г. н., проф.
V.M. Gorbatov FRCFS of RAS, RF

Annotation. *This article presents the results of research to study the impact of cultivation techniques on the energy efficiency of winter triticale on green fodder. It is established that the use of triticale for green fodder is most appropriate in the earing phase, which allows to obtain from a hectare of crops, depending on the variety and sowing date, 29177-74919 MJ / ha of metabolic energy.*

Key words: *triticale, rye, wheat, sowing period, variety, green fodder, gross energy, metabolic energy.*

Introduction. The selection process for breeding triticale varieties is carried out in two main directions. The first is the creation of fodder varieties and the second is the creation of grain varieties [2, 3]. Varieties of fodder triticale are intended for early spring green mass, haylage and silage [5, 6, 7]. Fodder triticale have later earing dates, which allows to extend the green conveyor for 10-12 days after mowing rye. In addition, triticale gives twice the yield of green mass than wheat, the crops of which are completely irrational to use for green fodder, and significantly exceed this indicator of rye. Triticale green mass also has a significant advantage in terms of protein, sugars and carotenoids, which provides higher growth of animals and better edibility of triticale green mass than rye. In addition, the green mass of rye after plucking quickly coarsens and is poorly eaten by animals.

It should also be noted that triticale, harvested for green fodder, is a good precursor for winter wheat, if it is processed before sowing on the type of semi-steam. After harvesting triticale, fodder crops of corn, Sudan grass, sorghum, and oatmeal mix work well, so triticale for green fodder allows to use sown areas more efficiently [9, 11].

The most realistic way to increase the sown area under fodder varieties of triticale, first of all, is to reduce by 50-70% of the sown area set aside for growing winter rye for green fodder. Second, completely replace winter soft wheat crops with green fodder with triticale crops for fodder use [4, 6].

The current level of agricultural production requires the involvement of an increasing number of material and energy resources, including to increase the yield of

crops. The efficiency of certain elements of the technology of growing winter crops is assessed by a number of economic and bioenergy indicators that characterize the degree of their payback and energy intensity [1].

In the technology of growing triticale on the green mass sowing dates and varietal composition do not change the sequence and number of production operations, but the impact of these agronomic techniques is manifested in the size and quality of green mass yield, which requires a detailed assessment of the effectiveness of these changes.

The aim of the research was to establish the energy efficiency of the use of winter triticale for green fodder in the Forest-Steppe conditions of the right-bank Ukraine.

Materials and research methods. Field studies were carried out at the agronomic research station of the National University of Life and Environmental Sciences of Ukraine in typical low-humus chernozems.

The object of research was winter crops: wheat Polisska 90 (control), rye Kyivska fodder (control) and triticale varieties (AD 3/5, AD 44, ADM 9, Polissky 29 ADM 11 AD 52), sown in five calendar dates: August 25, 5, 15, 25 of September and 5 October. The predecessor is corn for silage.

Research results and their discussion. Intensification of feed production is invariably accompanied by an increase in the cost of non-renewable energy [8]. Therefore, its rational use is one of the most important conditions for increasing feed production and increasing the yield of forage crops. This issue is especially acute in our time, when energy problems have become paramount.

Nowadays, in the conditions of instability of the credit and financial system of our state, high prices for fixed and current means of production, growth of production costs, development of energy-saving technologies of cultivation of agricultural crops is actual. Carrying out the accounting of the energy accumulated by a crop and the general (total) expenses of the energy used for its manufacture, allows to estimate expediency and efficiency of use of these or those agrotechnical measures and energy resources. Thus, a comprehensive bioenergy analysis of cultivation technology complements its valuation and is aimed at more efficient use of means of production. Calculations for energy analysis are performed in a single international unit – joules.

Energy evaluation of technological methods studied in the experiment was determined by technological maps by calculating energy consumption for growing crops on an area of 100 hectares and energy intensity of the crop, expressed in energy efficiency ratio (EER) – the ratio between energy consumed and reproduced with the crop [1,2,10].

The consumed energy was calculated on the basis of technological maps according to the content of the studied options. Studies have shown that energy consumption for 1 ton of crop and energy efficiency ratio largely depended on the variety, sowing date and phenological phase of growth and development. Thus, the amount of energy consumed per hectare of crops and reproduced with the harvest of exchange energy, as well as energy efficiency coefficients showed that in the tubing phase the efficiency of reproduction of spent energy was dominated by winter rye – its EER was 1,26-1,65 depending on the term sowing. The best among triticale varieties according to this criterion were varieties AD 3/5 and AD 52 – their EER was 1,07-1,44 and 1,03-1,40, respectively, depending on the sowing date. EER of winter

wheat was at the level of 0,74-0,98.

However, according to the indicator of efficiency of reproduction of the spent energy, it is more expedient to use on green weight all winter grain crops in a earing phase (table).

Energy efficiency of winter triticale cultivation depending on the variety and sowing period in the earing phase.

Type, variety	Sowing dates				
	25.08.	5.09.	15.09.	25.09.	05.10.
Energy consumed for growing crops, MJ / ha					
Rye (control)	23069	22951	23796	20137	17831
Wheat (control)	16126	17380	17902	15974	13724
AD 3/5	21605	21955	24692	20441	17706
AD 44	20217	21428	23570	19922	17715
ADM 9	20889	21562	23993	20379	17796
Polissky 29	21212	21813	24350	20453	17922
ADM 11	19759	20521	23112	19276	16288
AD 52	20728	21750	24826	20253	17526
Gross energy reproduced with yield, MJ / ha					
Rye (control)	110698	109489	118120	89614	66056
Wheat (control)	39777	52586	57919	47089	24108
AD 3/5	95744	99318	127274	92720	64792
AD 44	81560	93930	115811	87415	64874
ADM 9	88432	95304	120127	92088	65699
Polissky 29	91731	97861	123783	92830	66991
ADM 11	76887	84666	111138	80818	50305
AD 52	86783	97229	128649	90796	62950
Reproduced metabolic energy with yield, MJ / ha					
Rye (control)	64205	63504	68510	51976	38312
Wheat (control)	23071	30500	33593	27312	13983
AD 3/5	55532	57604	73819	53778	37579
AD 44	47305	54479	67170	50701	37627
ADM 9	51291	55276	69674	53411	38105
Polissky 29	53204	56759	71794	53841	38855
ADM 11	44594	49106	64460	46874	29177
AD 52	50334	56393	74616	52662	36511
EER					
Rye (control)	2,78	2,77	2,88	2,58	2,15
Wheat (control)	1,43	1,75	1,88	1,71	1,02
AD 3/5	2,57	2,62	2,99	2,63	2,12
AD 44	2,34	2,54	2,85	2,54	2,12
ADM 9	2,46	2,56	2,90	2,62	2,14
Polissky 29	2,51	2,60	2,95	2,63	2,17
ADM 11	2,26	2,39	2,79	2,43	1,79
AD 52	2,43	2,59	3,01	2,60	2,08

Mowing in this phase, the EER of winter triticale on the green mass, depending on the variety and sowing date was 1,79-3,01, Moreover, directly correlating with the level of yield, the maximum values of EER were observed for sowing on September 15 – 2.79-3.01. The most efficient were the use of varieties AD 52, AD 3/5, ADM 9 and Polissky 29, which, depending on the sowing period, reproduced the exchange energy at the level of 36511-74616 MJ / ha. EER of winter rye and wheat, depending on the sowing period, was 2,15-2,88 and 1,02-1,88, respectively.

During flowering, the coefficient of energy efficiency in all crops decreased sharply – to 0,69-1,15 in triticale, to 1,00-1,31 in rye and up to 0,59-0,71 in wheat.

Conclusions.

Thus, given the assessment of energy efficiency, the use of triticale for green fodder is most appropriate in the earing phase, which allows to obtain from a hectare of crops depending on the variety and sowing date 29177-74919 MJ / ha of metabolic energy.

List of references:

1. Бабич А.О., О.Є. Забродський, І.Й. Тібенський. Кормовиробництво – спеціалізована галузь. К.: Урожай. 1986. 184 с.

2. Білітюк А.П., Гірко В.С., Каленська С.М. Тритикале в Україні: монографія / за ред. А. П. Білітюка. Київ. 2004. 376 с.

3. Білітюк А.П., Каленська С. М. Вирощування і використання зерна і зеленої маси тритикале на корм в тваринництві. *Вісник аграрної науки*. 2003. № 3. С. 29-32.

4. Ирназаров Ш.И., Ирназарова Н. Влияние сроков посева на рост, развитие и урожайность озимой пшеницы и проса в пожнивном посеве в условиях серых сероземов на юге Узбекистана. Зерновое хазяйство. 2004. № 5. С.28-29.

5. Каленская С.М. Использование озимого тритикале в зеленом конвейере. Вестник Полтавского государственного сельскохозяйственного института. 2000. № 5. URL: http://www.agromage.com/stat_id.php?id=131.

6. Комаров Н.М., Поспелова Л.С., Соколенко Н.И., Атаманченко П.М., Бондаренко Г.М. Тритикале – важный резерв кормового поля. Кормопроизводство. 2002. № 4. С. 16-18.

7. Лопушняк В.І. Озиме жито – важлива культура зеленого конвеєра. Сільський господар. 2001. № 3-4. С. 16-17.

8. Медведовський О.К., Івахненко П.І. Енергетичний аналіз інтенсивних технологій в сільськогосподарському виробництві. К.: Урожай. 1988. 208 с.

9. Плакса В.М., Каленська С.М., Король П.П. Поширення тритикале в світі. Сучасні аграрні технології. 2013. № 1. С. 34-38.

10. Рахметов Д.Б. Роль новых культур в обеспечении устойчивого развития кормопроизводства в Украине // Корма и кормопроизводство. Винница. 2003. № 51. С. 142-145.

11. Щипак Г.В. Селекція і насінництво тритикале озимого. Спеціальна селекція і насінництво польових культур. Харків. 2010. С. 70-107.

Анотація. *В даній статті викладені результати досліджень щодо вивчення впливу технологічних прийомів вирощування на енергетичну ефективність використання тритикале озимого на зелений корм. Встановлено, що використовувати тритикале на зелений корм найбільш доцільно у фазі колосіння, що дозволяє отримувати з гектара посівів, залежно від сорту та строку сівби, 29177-74919 МДж/га обмінної енергії.*

Ключові слова*: тритикале, жито, пшениця, строк сівби, сорт, зелений корм, валова енергія, обмінна енергія.*

© Svystunova I., Vaskivskii B., Poltoretskyi S.,
Grinchishin O., Rebezov M.