

Corn Hybrids: Increasing the fresh yield capacity

Z.I. Usanova*, P.I. Migulev, Yu.T. Farinyuk, M.N. Pavlov and A.S. Vasiliev

Tvers State Agricultural Academy, Tver, Russia

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ABSTRACT

This paper presents the results of a study of the productivity of 34 corn hybrids. It was revealed that the hybrids LG 30189 (Lima Grain, France) and Zeta 110 S (LABOULET, France) with a total fresh yield of 87.5 and 91.8 t/ha and absolute dry yield of 21.39 and 18.52 t/ha were the most productive. The cultivation of hybrids of the 1st productivity group in the conditions of the Russian market of agricultural products is economically profitable, which allowed obtaining 61.3 to 83.4 thousand rubles/ha of imputed net income with a production profitability level of 180.8 to 209.9%.

Key words : Productivity, Efficiency, Agriculture, Variety.

Introduction

Corn (*Zéa mays* L.) is a valuable crop that can be used in various ways (Posypanov *et al.*, 2015; Shults, 2016; Paulsen *et al.*, 2019; Hussein *et al.*, 2020; Usanova *et al.*, 2018b). Its biological characteristics and genetic diversity allow obtaining high yields in various regions of the world, including in the northern regions of corn growing, which include the Tver region of the Russian Federation (Usanova and Migulev, 2019; Usanova, *et al.*, 2020). It silages well at any stage of ripeness, but better in the milky-wax stage. In this phase, 100 kg of fresh yield, according to various sources, contain from 20 to 24 feed units and 1,200-1,500 g of digestible protein (Otor, 2017; Toporov, 2014). Corn production is important in increasing the food supply of the population, the level of employment, as well as the development of many sectors of the economy (Azubekov *et al.*, 2017; Usanova *et al.*, 2018a).

The main challenge for rural producers is to choose the best hybrids that are more productive and cost-efficient in production.

This study aims to identify the most productive

corn hybrids that provide the best parameters of economic efficiency.

Methods

The studies were carried out in 2019 on soddy-podzolic well-cultivated soil formed on cover loam in the crop rotation of the Skopa LLC in the Sonkovsky district of the Tver region (Russia). We studied 34 corn hybrids (Table 1).

In the course of our studies, we identified the structure of the crop, its yield capacity, and dry yield per hectare according to the method developed by Usanova *et al.* (2020).

Results

We found that out of 34 studied hybrids, 14 (41.2%) reached milky-wax ripeness and 6 (17.6%) reached milky ripeness. In the rest of the hybrids (41.2%), the grain did not reach the milky ripeness stage.

Different genetic characteristics of the hybrids influenced the fresh yield capacity. Based on this, four groups of hybrids were identified (Toporov,

2014) (Figure 1 and Table 2).

Zeta 110S hybrids with a fresh yield of 91.8 t/ha and absolute dry yield 18.9 t/ha and LG30189, where those parameters equaled 87.5 and 21.39 t/

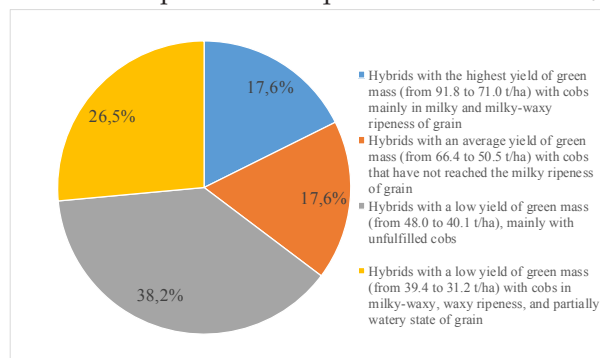


Fig. 1. Classification of hybrids into groups

Table 1. Characteristics of the studied corn hybrids

Hybrids (hybrid)	FAO	Origin	Hybrids (hybrid)	FAO	Origin
MAS 18L	200	Mas Seeds	Competence	200	KWS
MAS 14G	190	(France)	Cromwell	180	(Germany)
MAS 10A	160		Corypheus	190	
MAS 15T	200		Clifton	175	
Zeta 110 N	110	LABOULET	SILVINIO	220	
Zeta 140 N	140	(France)	ZP 165 MV	160	COMPOUND FEED
ELAMIA	210		ZP 153 MV	150	MILL (KKZ) ZOLOTOTI
Zeta 115C	115		ZP 200 SV	200	POCHATOK LLC
Silicia	170		ZP 190 SV	190	(Russia)
Zeta 105 S	95		Cascade 195 SV	190	
Lg 2195	190	Lima Grain	Cascade 166 ASV	160	
Nikita	260	(France)	Voronezhsky 158	160	
Lg 30179	170		Cascade 195 SV	190	Rossoshgibrid LLC
Lg 30189	180		Voronezhsky 160	160	(Russia)
Lg 30215	200		Voronezhsky 158	160	
Lg 31233	230		Cascade 166 SV	170	
Lg 31235	240		Voronezhsky 175 ASV	180	

Table 2. The group of varieties with the highest fresh yield capacity (70.0 t/ha and more)

Variety (hybrid)	FAO index	Origin (manufacturer)	Yield capacity, t/ha		Absolute dry substance content, %			The yield of abs. dry phytomass, t/ha
			Fresh yield	Including cobs	In the stems and leaves	In cobs	In the fresh yield	
Zeta 110 C	110	LABOULET (France)	91.8	16.3	20.0	20.7	20.1	18.5
Lg 30189	180	Lima Grain (France)	87.5	24.3	24.3	24.8	24.4	21.3
Lg 31233	230		79.1	24.5	19.8	17.2	19.0	15.0
Lg 2195	190		74.5	15.8	19.2	22.6	19.9	14.9
Lg 30179	170		73.0	20.2	22.8	26.1	23.7	17.3
MAS 15T	200		71.0	19.6	18.7	21.5	19.5	13.8
Group average			79.5	20.2	20.8	22.1	21.1	16.8

ha, turned out to be more productive in terms of the fresh yield and absolute dry yield. Their differences lie in the dry matter content in the cobs, 20.7 and 24.8%, respectively, which is explained by the fact that the cobs of the Zeta110S hybrid were made with grain up to half of their length.

The intensification of production is inextricably linked with obtaining the highest parameters of profit and the level of profitability. In this regard, achieving higher yields of corn hybrids should be economically justified.

Calculations of economic efficiency were carried out based on drawing up technological maps, separately for each hybrid. The cost of the crop was estimated by the yield of fodder units, 1 fodder unit at the market price for 1 kg of oats.

Table 3. Economic efficiency of the production of the fresh yield of different corn hybrids with cobs in milky-wax ripeness

Parameters	Corn hybrid					
	Zeta 110 C	Lg 30189	Lg 31233	Lg 2195	Lg 30179	MAS 15T
Yield of feedunits, t/ha	192.8	183.8	166.1	156.5	153.3	149.1
Fresh yieldcost thousand rubles/ha	123,186.4	117,416.3	106,144.3	99,971.6	97,958.7	95,274.9
Productioncosts per 1 ha, thousand rubles	39,750.6	38,546.4	36,194.0	34,905.8	34,485.7	33,925.6
Imputed net incomethousand rubles/ha	83,435.8	78,869.9	69,950.3	65,065.8	63,473.0	61,349.3
Cost of 1 ton of fresh yieldrubles	433.0	440.5	457.6	468.5	472.4	477.8
Profitability level%	209.9	204.6	193.3	186.4	184.1	180.8

Analysis of economic efficiency indicators of the most productive hybrids (Table 3) shows a great economic advantage of growing them. Thus, the imputed net income from the use for the sowing of the Zeta 110 C hybrid which had the maximum yield (91.8 t/ha) exceeds the imputed net income of the less productive variety Lg 30179 (71.0 t/ha) by 22 thousand rubles and at the level of production profitability by 29.1%.

The cultivation of hybrids of the 1st productivity group allowed obtaining 83.4 to 61.3 thousand rubles/ha of imputed net income with a production profitability level of 180.8 to 209.9% and a cost price of 1 ton of fresh yield at the level of 433.0 to 477.8 rubles.

The imputed net income per hectare from the use of hybrids of the first group turned out to be 1.5 times higher, and the level of profitability was 1.2 times higher than that of the hybrids of the second productivity group.

Conclusion

In 14 hybrids (41.2%), the cobs reached the milky-wax ripeness of the grain. The variety of hybrids (34) differed in yield. Eight hybrids (23.5%) had a higher fresh yield capacity (71.0-91.8 t/ha).

The cultivation of hybrids of the 1st productivity group in the conditions of the Russian market is economically profitable and allowed obtaining 61.3 to 83.4 thousand rubles/ha of imputed net income with a production profitability level of 180.8 to 209.9%.

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