USC: 631.8:631.527.5 .: 633.15:632

PALAMARCHUCK V., candidate of agricultural Sciences , Associate Professor
POLISHCHUK M.I., candidate of agricultural Sciences, Associate Professor
POLISHCHUK I.S., candidate of agricultural Sciences, Associate Professor
KOLESNIK O.M., Assistant
PALAMARCHUCK O.D., undergraduate
Vinnytsia National Agrarian University

EFFECT OF TECHNOLOGY ELEMENTS ON THE DEVELOPMENT OF CORN FOR BIOETHANOL PRODUCTION

The article describes the dependence of phenological phases duration of in different maize hybrids from sowing. The opportunity, in terms of increased productivity corn, is shown, its use for alternative energy sources - bioethanol and biogas. Presented are characteristics of remounting, the initial rate of growth and drought resistance of maize plants.

Keywords: *phenological phase, time of sowing, growing season, hybrid maize, remounting, growth, drought resistance, yield .*

Introduction: Nowadays, in the event of shortage of energy resources, much attention is paid to the possibility of using crops to produce alternative energy. These crops include maize and with one ton of which grain can be received up to 350 liters of ethanol and 180 m^3 of gas from one tone leaf-stock mass. Therefore, increasing productivity of this crop would allow processing of grain for bioethanol and biogas, and expand opportunities in a sharp increase in the area of crop culture.

An important element of grain maize cultivation technology is the use of different sowing. This action causes the processes of plant growth and development, and the formation of its performance, immunological status of crops [1, 2 , 3].

Corn stocks inefficiently use solar energy, heat and moisture in the first half of the growing season for two months after sowing (third decade of April to mid-June) -

grows slowly, and in the second half of the growing season when leaf area reaches its maximum inflow of radiation is on the decline, decreasing temperature and moisture reserves . Improve efficiency of maize agroecological resources possible variation of sowing, and by the passage of time and phenological phases of plant development and selection of hybrids with different vegetation periods [3].

Question of determining the optimal sowing time has been studied long ago, but every year in the State Register of Plant Varieties suitable for distribution in Ukraine, new corn hybrids, which differ not only by ripening and several morphological characters, but also react differently to the duration of the day , the quality of sunlight , the degree of moisture, air temperature and other environmental conditions [4]. Besides global warming significantly shifted the onset of optimum sowing corn, so the study of this question is urgent and necessary.

Material and methods of the study: Studies were conducted in the experimental farm households SE " Kordelivske " v. Kordelivka ,Kalinowka district, Vinnytsia region .

In experiments was determined the economic and biological evaluation of corn hybrids firms depending on sowing time. For this were laid the industrial field tests in which were sown over 30 corn hybrids of different maturity groups in three periods (early - when soil temperatures at seeding depth is 6-8 º C , average - when soil temperature at a depth of seeding 8-10 º C and later soil temperature at a depth of seeding 10-12 º C).

It was performed by drill sowing SUPN -8 updated, with seeding rate of 75 thousand units seeds per hectare. Seeding depth was 4-5 cm.

Area of land discount for hybrids was 10.5 m^2. Repeating in experiments for hybrids was - 3 times a day. Placing parts was - by random blocks.

During the growing season spent determining phenological phases such as stairs, throwing and flowering panicles, flowering heads (appearance stamen threads) and full grain ripeness , the definition of linear measurements of plant : overall height , the height of the attachment plug and structural analysis of harvest (10 forks in each

repetition), conducted in accordance with generally accepted methods for maize [5,6].

In evaluating plant resistance against corn borer damage in the phase of full maturity of grain was determined percentage of damaged plants (if any wormholes in the stem and fork leg). The extent of damage was determined as a percentage, the method V. Wolfhound [6].

Physiological ripeness of grain set with the appearance of "black layer" based on grains by the method M. Cristea, D. Funduianu, S. Reichbuch [7], according to which four seeds were removed from the middle ear in the area four most common heads , in the presence of "black layer " in three caryopsides three forks .

Accounting corn harvest from your square method was performed according to state testing of agricultural crops (grains, cereals and legumes) VV Wolfhound [6].

Research results: To develop optimal cultivation technology of maize hybrids one needs know and take into account changes in patterns of environmental factors influenced by processing methods , growth and development of plants and their requirements at every period of life to certain factors. The most important acquired the needs of crops for phenological phases and stages of organogenesis.

In the process of growing plants adapt to the changing conditions of vegetation (adapted). This is facilitated by hereditary biophysical and biochemical characteristics of cells that provide the body's vital functions, including growth in wide for each plant species within the temperature, light and other conditions.

The first period of growth and development of maize is characterized by the fact that young seedlings are fed by plastic substances seed and only after the appearance of 3 - 4th leaf plant begins to absorb nutrients from the soil. The most intensive is the absorption of nutrients from the soil in the formation of secondary roots. Because of this, the creation of favorable conditions during this period of development will significantly improve plant productivity.

During the research we marked a significant impact on the length of the growing season performance linear dimensions of plant height laying heads.

We found out that the forms of maize are characterized by a long growing period and extended period from flowering to full ripeness of grain have increased resistance to stem rot lesions compared to forms which are characterized by short vegetation period and the second short period of plant development (flowering , full grain ripeness) [1].

The optimal mix of performance and duration of phase between periods when there is time to flower heads during and after the level. During the period when the grain filling period of less than stairs - flowering heads of grain filling intensity is low , due to the weight of 1000 grains , but this disadvantage is compensated much better grain fullness of head. Reducing the period from germination to panicle venting reduces seed productivity. Increase individual productivity of maize plants was achieved by extending the period of ripening grain.

Characteristics of the passage of phenological phases and the growing season maize hybrids of different maturity groups at different sowing terms given in Table 1. From the data in Table 1. shows that during germination of maize seeds substantially depends on sowing time . In particular, when planting corn in the early period of germination period was 15-20 days, average - 10-11 days late - 6-7 days.

The dynamics of germination due to flow temperature indicators in 2011, under the provision of the best temperatures for late sowing ensured reduce germination of corn hybrids by an average of 12-14 days. As for periods stairs - flowering heads and flowering heads - full ripeness of grain they delayed sowing in general also decreased which resulted in the reduction of the growing season , at a later date of sowing .

Table 1

Characteristics of corn hybrids for the duration of phenological phases and the growing season in SE DG " Kordelivske " Kalinowka District, days (2011-2012)

№	Hybrid's name	Phenological phases																							
		sowing – springs						springs – flowering heads						flowering heads – full maturity						springs – full maturity					
		early sowing		medium sowing		late sowing		early sowing		medium sowing		late sowing		early sowing		medium sowing		late sowing		early sowing		medium sowing		late sowing	
		2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
Early maturity group																									
1.	SSC 2971	15	8	11	8	6	9	64	63	58	61	60	60	62	52	61	61	61	59	126	115	119	122	121	119
2.	SSC 2960	19	8	11	7	6	10	62	65	58	63	62	59	61	57	58	60	54	58	123	122	116	123	116	117
3.	SSC 2949	15	8	10	8	7	11	66	63	60	60	59	57	53	57	60	56	55	54	119	120	120	116	114	111
4.	EE 2807	15	8	11	8	6	10	65	64	58	60	61	56	62	51	60	62	55	62	127	115	118	122	116	118
Medium early maturity group																									
5.	EG 3421	19	10	11	7	7	9	64	63	62	64	62	61	61	56	57	58	54	58	125	119	119	122	116	119
6.	EG 3222	15	9	11	8	7	9	66	64	61	64	62	60	61	58	58	58	52	59	127	122	119	122	114	119
7.	EG 3324	16	11	11	6	7	11	65	63	62	64	61	59	61	58	60	60	54	59	126	121	122	124	115	118
8.	SSC 3476	17	9	11	7	7	11	66	67	61	66	63	58	59	61	65	65	60	65	125	128	127	131	123	123
Medium early maturity group																									
9.	SSC 3511	17	9	10	8	6	11	63	64	64	65	65	62	62	56	67	67	58	64	125	120	131	132	123	126
10.	SSC 3420	15	9	11	6	6	8	67	64	63	66	62	60	63	61	66	67	67	66	130	125	129	133	129	126
11.	SSC 4	15	10	10	7	6	10	66	63	63	61	62	59	63	56	57	59	59	64	129	119	120	120	121	123
12.	SSC 5	16	8	10	8	6	11	66	64	63	65	63	59	60	51	58	59	59	58	126	115	121	124	122	117

Vegetation period of maize hybrids in 2011 with early sowing fluctuated between 119-141 days, average - 116-139 days late - 113-135 days.

In 2012, when sown in the early period of germination period was 8-19 days of sowing medium - 6-9 days, and at late sowing - 8-11 days. Characterization of germination period changes depending on sowing maize in 2012 related to the provision of plant moisture and temperature, as marked by a slight reduction in the period of late sowing. Period stairs - flowering heads at an early stage of sowing ranged from 62-64 days, average - 60-68 days late - 56-66 days. Second growing season flowering heads - full ripeness at an early stage of sowing ranged within 50-68 days, with an average 55-74 days late - 54-74 days. Vegetation period maize hybrids in 2012 with early sowing fluctuated between 113-135 days, average - 116-140 days late - 111-140 days.

It should be noted in the growth process a phenomenon remounting - continuous development in maize.

Remounting is determined by genetic factors and is well transmitted from generation to generation. This phenomenon manifests itself in the form of the fact that certain forms or biotypes, with ripe corn leaves and stems do not dry up and remain green for some time. Remounting can be of two types: 1) the number of samples accelerated ripening grain accompanied by a simultaneous yellowing and drying husks of ears while keeping leaves and stems in a green state , and 2) samples of corn, in which the occurrence of full maturity leaf-stock whole grain weight, including wrappers remain green. When you combine harvesting grain hybrids are the most adaptable of the first type of display remounting.

Characteristics of corn are based remounting given in Table 2.

Remounting plants remain at a high level the speed of biochemical processes in the stem, with plenty of living parenchyma cells of the stem and the stem are characterized by high strength (resistance to lodging) and increased resistance to stem rot. Maize, according to V.G. Ivashchenko (1976), which ripens the green stem, not lodges by cells turgor.

Data in Table 2 shows that the highest rates of growth in 2011 in the early stages of development have been in such hybrids as: DKS 2971, EE 2807, SSC 3511 and EG 3324. In 2012 - EG 3421, EE 2807, SSC 5, SSC 2971, SSC 2949, EG 3222. These hybrids have higher competitiveness against weeds factors for life.

Table 2

Description of remounting and drought resistance in maize hybrids (for 2011-2012) point

№	Hybrid`s name	Growth rate, ball		Remontantness, ball		Type of remounting	Drought resistance, ball	Cold resistance, ball
		2011 p.	2012 p.	2011 p.	2012 p	2011 p.	2011 p.	2012 p.
1.	SSC 2971	9	8,5	8	6	1	9	8,0
2.	SSC 2960	6	7,5	6	8	1	9	7,0
3.	SSC 2949	8	8,5	6	6	1	8	7,5
4.	EE 2807	9	9,0	6	7	1	9	8,0
5.	EG 3421	7	9,0	9	8,3	1	9	8,0
6.	EG 3222	8	8,5	8	7,3	1	8	8,0
7.	EG 3324	9	7,5	6	7,7	1	9	7,5
8.	SSC 3476	6	7,0	7	8	2	8	7,5
9.	SSC 3511	9	7,5	6	7	1	9	7,0
10.	SSC 3420	7	7,5	7	6	1	8	7,5
11.	SSC 4	6	8,5	7	6	1	7	8,0
12.	SSC 5	7	9,0	9	6	2	9	8,0

The slow initial growth and development , in 2011 , had such hybrids as : SSC 2960, SSC 3476 , SSC 4 in 2012 - SSC 3476 .

As to remounting, the highest score it during the years of study set out in the following hybrids: EG 3421 and SSC 5. The lowest - in hybrids: SSC 3472, SSC 3420 , SSC 2949 , SSC 4, EE 2807 , SSC 3511.

Resistant to moisture deficit (drought conditions) in the phase of 5-7 leaves in 2011 were the following hybrids: SSC 2971, EG 3421 , SSC 2960, EE 2807 , SSC 3511 , EG 3324 and SSC 5.

The most cold-resistant hybrids in 2012 were hybrids: EG 3421, EG 3222, SSC 5, SSC 2971, EE 2807 and SSC 4, which did not reduce the rate of growth at low positive temperatures as characterized the 2012 growing season (end of April).

Conclusions: By the results of our study, it was found that the studied hybrids differed significantly by factors such as growth , drought resistance, cold resistance and remounting . Selection of hybrids according to characteristics allow the efficient use of adaptive properties of different hybrids when growing them in different soil and climatic zones.

Sowing significantly affect the duration of the growing season and some phenological phases in maize. Delay in sowing reduces the period of germination and length of the growing season maize hybrids studied.

Duration of the major periods of the growing season corn hybrids depends strongly on climatic conditions of the year, as evidenced by the research results obtained during 2012.

Bibliography

1. Паламарчук В. Д. Кукурудза селекція та вирощування гібридів: [Моногр.] / В. Д. Паламарчук, В. А. Мазур, О. Л. Зозуля. – Вінниця, 2009. – 199 с.

2. Паламарчук В.Д. Еколого-біологічні та технологічні принципи вирощування польових культур / В.Д. Паламарчук, О.В. Климчук, І.С. Поліщук, О.М. Колісник, А.Ф. Борівський. – Вінниця, 2010. – 636 с.

3. Паламарчук В.Д. Системи сучасних інтенсивних технологій у рослинництві: Навчальний посібник / В.Д. Паламарчук, І.С. Поліщук, О.М. Венедіктов. – Вінниця, 2011. – 381 с.

4. Грабовський М. Сівба кукурудзи. / М. Грабовський // Агробізнес сьогодні. – 2011. – №18(217) вересень. – С. 24-27.

5. Методические рекомендации по проведению полевых опытов с кукурузой / ВНИИ кукурузы. – Днепропетровск, 1980. – 54 с.

6. Методика державного сортовипробування сільськогосподарських культур (зернові, круп’яні та зернобобові) Під загальною редакцією голови

Держкомісії України по випробуванню та охороні сортів рослин, кандидата сільськогосподарських наук В. В. Вовкодава. – К.: 2001. – 64 с.

7. Cristea M., Funduianu D., Reichbuch S. Precocitatea la porumb // Probl. Gen. teor. Application. – 1978. – Vol. 10, № 3. – P. 331 – 374.

Анотація

Паламарчук В.Д., Поліщук М.І., Поліщук І.С., Колісник О.М., Паламарчук О.Д.,

Вплив елементів технології на розвиток кукурудзи для виробництва біоетанолу

У статті приводиться залежність тривалості фенологічних фаз у різних гібридів кукурудзи від строків сівби. Показана можливість, в умовах збільшення продуктивності зерна кукурудзи, використання її для отримання альтернативних джерел енергії – біоетанолу та біогазу. Приведена характеристика ремонтантності, темпів початкового росту та посухостійкість рослин кукурудзи.

Ключові слова: *фенологічна фаза,строк сівби, період вегетації, гібрид кукурудзи, ремонтантність, темпи росту, посухостійкість, урожайність.*

Аннотация

Паламарчук В.Д., Полищук М.И., Полищук И.С., Колесник О.М. , Паламарчук О.Д.

Влияние элементов технологии на развитие кукурузы для производства биоэтанола

В статье приводится зависимость продолжительности фенологических фаз у разных гибридов кукурузы от сроков сева.

Показана возможность, в условиях увеличения производительности зерна кукурузы, использование ее для получения альтернативных источников энергии – биоэтанола и биогаза. Приведена характеристика ремонтантности, темпов начального роста и засухоустойчивость растений кукурузы.

Ключевые слова: *фенологические фазы, срок сева, период вегетации, гибрид кукурузы, ремонтантность, темпы роста, засухоустойчивость, урожайность.*