STUDIES REGARDING THE PHENOLOGIC EVOLUTION OF MAIZE UNDER THE INFLUENCE OF CLIMATE CONDITIONS AT THE DIDACTIC STATION IN TIMISOARA, ROMANIA

Ioan L. LUPU[1], Paul PÎRȘAN [1]

e-mail: yonika82@yahoo.com

Abstract

In 2013 and 2014, years with medium climate favourability for maize, we monitored the growth and development of three maize hybrids from different precocity groups FAO 280, FAO 490, and FAO 550. Plant growth and development was influenced by precipitations and temperature. A rainfall regime rich in ripening phenol-phases determined their prolongation. The vegetation period (sprouting – full ripening) was longer in all three hybrids in 2014. The maize hybrid from group FAO 490 was closer in length of vegetation period to that of the hybrid from group 280 than to that from the group 550. Measurements regarding the phenological evolution were made primarily to avoid an overlapping with climate conditions given that both temperature and precipitations have more or less significant effects on yield depending on maize pheno-phase.

Key words: maize cultivation technology, basic soil works, sowing time, pheno-phases, productivity elements, productions.

Climate change, because of the uneven distribution of precipitations and of high temperatures in summer, stress plant making them adapt to these conditions. From a both agriculturist and biologist's point of view, the capacity of adapting is quantified by the yield, i.e. by the incomes for agriculturists and the perspective of perpetuate the plant species for the biologists.

As a response to climate conditions, plants can prolong or shorten development pheno-phases and, consequently, their vegetation period.

There is, together with very many other research directions regarding the diminution of unfavourable effects of climate change, an inexpensive possibility of finding and recommending for cultivation cultivars and hybrids with higher adaptability to unfavourable environmental conditions.

MATERIAL AND METHOD

In 2013 and 2014, we monitored the phonological evolution of three maize hybrids with different periods of vegetation (Gavot-FAO 280, Kitty-FAO 490, Mikado-FAO 550) sowed in the second decade of April.

The pheno-phases monitored were:

- sprouting;
- 6-leaf stage;
- appearance of the panicle;
- milk ripening;
- wax ripening;
- full ripening (noting the date the plants entered the respective phase).

The trial was organised at the Didactic Station from Timisoara, Romania. Climate conditions are presented in Tables 1 and 2 below: they point out that 2014 was favourable to maize due to the precipitations and to normal temperatures, while 2013 was medium-favourable because of the low level of precipitations in June and July (that caused soil dryness).

The effects of water deficit were amplified by excessive temperatures in July and August.

Table 1. Mean monthly temperatures at the Meteorological Station in Timisoara in 2013 and 2014 compared to multiannual means

RESULTS AND DISCUSSION

We can see that in both years sprouting was quick: 10 and 8 days, respectively.

In 2013, the 6-leaf stage was reached by the maize hybrid Gavot in 20 days, by the maize hybrid Kitty in 23 days and by the maize hybrid Mikado in 36 days.

In 2014, the first two maize hybrids reached the 6-leaf stage in 22 and 27 days, respectively, i.e. 2 and 4 days, respectively, later than in 2013, while the maize hybrid Mikado reached it in 38 days.

[1] BUASVM "Regele Mihai I al României", Timișoara

Though the maize hybrid Kitty belongs to a precocity group closer to that of the maize hybrid Mikado, it has a quicker development close to that of the maize hybrid Gavot.

Panicle appearance in 2013 occurred 48 days after sprouting in the maize hybrid Gavot, 51 days after sprouting in the maize hybrid Kitty and 81 days after sprouting in the maize hybrid Mikado.

In 2014, the three maize hybrids had a similar evolution.

Milk ripening in 2013 in the maize hybrid Gavot occurred 84 days after sprouting and 36 days after panicle appearance. In the maize hybrid Kitty, the period was 4 days longer and in the maize hybrid Mikado it occurred 108 days after sprouting and 27 days after panicle appearance (on August 16).

In 2014, milk ripening occurred 89 days after sprouting in the maize hybrid Gavot, 92 days after sprouting in the maize hybrid Kitty and 113 days after sprouting in the maize hybrid Mikado, i.e. on July 27, July 30 and August 20, respectively.

Wax ripening in 2013 occurred 16 days after milk ripening in the maize hybrid Gavot, 21 days after milk ripening in the maize hybrid Mikado; in 2014, it occurred 19 days after milk ripening in the maize hybrid Gavot, 23 days after milk ripening in the maize hybrid Kitty, and 34 days after milk ripening in the maize hybrid Mikado.

Full ripening was reached, in 2013, 112 days after sprouting in the maize hybrid Gavot, 117 days after sprouting in the maize hybrid Kitty and142 after sprouting in the maize hybrid Mikado, i.e. on August 20, August 25 and September 20, respectively.

In 2014, vegetation was longer because there were excessive precipitations in August (111.2 mm) and September (60.5 mm).

Full ripening occurred 122 days after sprouting in the maize hybrid Gavot, 129 days after sprouting in the maize hybrid Kitty and 159 days after sprouting in the maize hybrid Mikado, i.e. on August 28, September 5 and October 5.

Vegetation period in maize was shorter in the dry, extremely hot year.

Thus, in 2013, vegetation lasted 112 days in the maize hybrid Gavot, 117 days in the maize hybrid Kitty and 142 days in the maize hybrid Mikado; in 2014, it lasted 122, 129 and 159 days, respectively.

Table 3. Main phenological data in the three maize hybrids at the Didactic Station of the BUASVM from Timisoara (2013)

Table 1.

Mean monthly temperatures at the Meteorological Station in Timisoara in 2013 and 2014 compared to multiannual means

Year	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
2013	1.4	3.9	5.2	13.1	17.9	20.4	23.0	23.9	15.4	12.7	9.0	1.1
2014	3.1	5.7	9.2	12.7	16.2	20.7	22.1	22.1	17.2	12.3	10.8	7.5
Annual means	-1.2	0.4	6	11.3	16.5	19.6	21.6	20.8	16.9	11.3	5.7	1.4

Table 2.

Mean monthly precipitations at the Meteorological Station in Timisoara in 2013 and 2014 compared to multiannual means

Year	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
2013	54.3	37.1	98.3	32.7	97.0	47.5	24.9	50.9	62.8	55.0	52.0	1.2
2014	41.7	16.7	13.4	41.3	146.8	57.7	120.9	64.2	63.7	83.7	85.2	87
Annual means	40.9	40.2	41.6	50	66.7	81.1	59.9	52.2	46.1	54.8	40.6	47.8

Tables 3 and 4 s on which the plants reached these phenol-phases.

Table 3.

Main phenological data in the three maize hybrids at the Didactic Station of the BUASVM from Timisoara (2014)

Sowing time	Pheno-phases of maize hybrids	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.
I	Sowing	20						
	Sprouting	30						
	6-leaf stage		20 in maize hybrid Gavot 23 in maize	05 in maize hybrid Mikado				

			hybrid Kitty					
	Panicle appearance			17 in maize hybrid Gavot 20 in maize hybrid kitty	20 in maize hybrid Mikado			
	Milk ripening				23 in maize hybrid Gavot 27 in maize hybrid Kitty	16mikado		
	Wax ripening					08 in maize hybrid Gavot 17 in maize hybrid Kitty	18 in maize hybrid Mikado	
	Full ripening					20 in maize hybrid Gavot 25 in maize hybrid Kitty	20 in maize hybrid Mikado	
	Harvesting					29in maize hybrid Gavot	09 in maize hybrid Kitty	07 in maize hybrid Mikado

Table 4.

Main phenological data in the three maize hybrids at the Didactic Station of the BUASVM from Timisoara (2014)

Sowing time	Phenol-phases of maize hybrids	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.
I	Sowing	20						
	Sprouting	28						
	6-leaf stage		22 in maize hybrid Gavot 27 in maize hybrid Kitty	07 in maize hybrid Mikado				
	Panicle appearance			18 in maize hybrid Gavot 20 in maize hybrid kitty	23 in In maize hybrid Mikado			
	Milk ripening				27 in maize hybrid Gavot 30 in maize hybrid Kitty		20 in maize hybrid Mikado	
	Wax ripening					15 in maize	23 in maize	

						hybrid Gavot 22 in maize hybrid Kitty	hybrid Mikado	
	Full ripening					28 in maize hybrid Gavot	05 in maize hybrid Kitty	10 in Maize hybrid Mikado
	Harvesting					29 in maize hybrid Gavot	09 in Maize hybrid kitty	07 in maize hybrid Mikado

CONCLUSIONS

1) Vegetation in maize hybrids is influenced by the amount of precipitations, particularly in fructification pheno-phases, determining its prolongation.
2) Extremely high temperatures associated with water deficit during fructification pheno-phases determine the shortening of the vegetation period.
3) Maize hybrid Kitty from precocity group FAO 490 had, in both trial years, a vegetation period closer to that of the maize hybrid Gavot from precocity group FAO 280 than the maize hybrid Mikado, though the latter belong to a precocity group closer to FAO 550.

REFERENCES

Bîlteanu, Gh., Bîrnaure, V., - *Fitothnie*, E.D.P. București, 1989.

Pîrșan P, David Ghe., Imbrea Fl., - *Fitotehnie,* Vol. 1, ed. Eurobit Timișoara, 2006.

Pîrșan P, Imbrea Fl., Găvruță A., Botoș L., -*Research on the cultivation tehnologies of maize on permanent vegetal cover-* lucrări științifice – Zilele Academice Timișene USAMVBT TIMȘOARA, Vol XXXIV, 2004.

Pop Georgeta, - *Tehnologia culturilor de câmp,* Editura Augusta, Timișoara 2003.

Roman Gh., Valentin, Valeriu Tabără, Paul Pîrșan, Mihail Axinte și colab. – *Fitotehnie – Vol 1, cereale și leguminoase pentru boabe.* Editura Universitară, București 2011.