ANNALS OF THE UNIVERSITY OF CRAIOVA

Series: ✓*Biology*
✓*Horticulture*
✓*Food products processing technology*
✓*Environmental engineering*

Vol. XXX (LXVI) - 2025

PRODUCTIVITY OF SOME PLUM CULTIVARS UNDER THE CLIMATIC CONDITIONS OF THE REPUBLIC OF MOLDOVA

Burlacu Maxim[1], Pește anu Ananie[1]*
[1*]Technical University of Moldova,
** Correspondence author. E-mail*: ananie.pesteanu@h.utm.md

Keywords*: cultivar, trunk diameter, phenophases, weight, yield:*

ABSTRACT

The study subjects were 6 plum cultivars of the European assortment as: 'Pitestean' (C), 'Cacanska Najbolia', 'Empresso', 'Stanley', 'Blue Free' and 'President', grafted on the Myrobalan seedling rootstock, planting distance 5.0x3.0 m, crown shape naturally pyramid. During the research, the trunk diameter and growth, trunk cross-sectional area, development of phenological phases of fruiting bodies, number of fruits, their average weight, fruit yield per tree and per unit area were studied. In the reference period it was established that the cultivars 'Pitești anca', 'Cacanska Najbolia', 'Empresso', 'Stanley', 'Blue Free' and 'President' allow to obtain yields from 11.7 to 25.4 t/ha of competitive quality, distributed over 45 harvesting days.

INTRODUCTION

In the Republic of Moldova, the area cultivated with plums in 2023 was 19.0 thousand ha, which represents 16.7 % of the country's fruit-growing area, and the fruit production was 150.0 thousand tons, accounting for 7.9 t/ha, respectively 19.7 % of the country's entire fruit production, ranking second after the apple species.

Worldwide, the plum assortment is very varied, comprising 2000 cultivars, which were formed in three large genetic centers, through the participation of numerous species of the genus Prunus. Trends in cultivar improvement worldwide are common and aim to obtain valuable cultivars that meet commercial and consumer requirements on the one hand, and the pedoclimatic and agronomic requirements of the cultivation area on the other hand, with good economic results (Botu 2004, Butac 2010, Cociu et al. 2007, Milatovic et al. 2019).

When selecting plum cultivars for establishing orchards with the respective species, plum producers must pay attention to the general characteristics of the cultivar, which include productivity, fruit quality, resistance to the main biotic and abiotic factors, as well as to some special ones, such as: fruit destination, resistance to transport, handling and storage (Butac et al. 2015, Juraveli et al. 2022).

It has been established that the best results in plum production in the conditions of the Republic of Moldova are obtained when using native and introduced plum cultivars, well adapted to the growing conditions, as well as cultivated for a long period on the territory of the country (Cimpoieș 2018, Pește anu et al. 2023, Popa et al. 2019). Currently, the recommended plum cultivar for various pedo-climatic zones in the country includes 29 cultivars, of which 15 are created within the Scientific-Practical Institute of Horticulture and Food Technologies, and the others come from

various international breeding centers (Juraveli et al. 2022).

This study aims to evaluate the behavior of 6 plum cultivars obtained in different breeding centers on the development processes and their productivity in an intensive cropping system during the fruiting period in the northern part of the country.

MATERIAL AND METHODS

The research was carried out in the plum plantation of the enterprise SRL "Agrofields", village Zgurița, district Drochia in 2024, where 6 cultivars of plum from the European assortment were taken as biological material: 'Pitestean' (C), 'Cacanska Najbolia', 'Empresso', 'Stanley', 'Blue Free' and 'President'. The Pitesteanca cultivar, obtained in Romania and considered more suitable for the pedo-climatic conditions of our country, was taken as a control. The trees were planted in the spring of 2018 with plum trees in the form of a rod. The trees were grafted onto the Myrobalan seedling rootstock, the planting distance was 5.0x3.0 m, and the crown shape was naturally pyramid.

The soil between the rows and between the trees in a row was maintained as black soil by mechanical loosening. The experimental sector is not irrigated.

Biological, stationary field and laboratory methods accepted for conducting experiments with plum culture were applied to the research objectives.

The research carried out estimated the diameter (spring, autumn 2024) and growth of the trunk, the cross-sectional area of the trunk, the number of fruits, their average weight, the fruit production per tree, per unit area.

The study of phenological and production characteristics was carried out based on observations, determinations and analyses of the development of trees and fruits in plum culture. Investigations regarding the onset of the phenophases of flowering and subsequent phenophases, as well as the harvest maturity, were carried out taking into account the phenological stages of plum culture.

The trunk diameter was studied at the end of the vegetation period by measuring it at a height of 30 cm from the ground level.

The average weight of the fruits was calculated by weighing 100 plums from each variant. The productivity of the plantation was established for each tree separately, by weighing the production from 32 trees and by calculations establishing the arithmetic mean for a tree and the production per unit area.

The experimental data were subjected to statistical processing by the method of dispersion analysis with the calculation of the limit difference with the application of the ANOVA and STATGRAPHICS 18.0 program packages.

RESULTS AND DISCUSSIONS

The results presented in Table 1 highlight that the trunk diameter of the plum trees studied depends on the biological characteristics of the cultivar and the fruit production recorded within the plantation.

In the spring of 2024, the trunk diameter of the cultivars studied ranged from 78.8 mm for trees of the 'Pitestean' cultivar to 103.4 mm for those of the 'Cacanska Najbolia' cultivar, where maximum values were recorded. The 'Empresso', 'President', 'Stanley' and 'Blue Free' cultivars recorded average values characteristic of these cultivars, constituting 88.1; 88.5; 89.3 and, respectively, 95.2 mm.

At the end of the growing season of 2024, the trunk diameter of the trees in the studied strata increased, constituting 87.8-113.4 mm, i.e. an increase in the studied index by 8.4-9.9 mm, which was largely influenced by the plum production recorded in

the tree crown (tab. 3), as well as the biological characteristics of the cultivar.

Noting that the 'Cacanska Najbolia' cultivar is characterized by a greater vigor of tree growth, under the influence of fruit production (38.0 kg/tree) we record a more obvious inhibition of the studied index (9.9 mm). The respective law is also valid for the trees of the 'Stanley' cultivar, the registered indices being 30.0 kg/tree and, respectively, 8.9 mm.

In the case of trees of the 'Pitestean' cultivar, which is a cultivar characterized by a lower growth vigor compared to the other investigated cultivars, the lower harvest from the respective trees (17.5 kg) intensified the trunk development process (9.0 mm).

The 'President, 'Blue Free' and 'Empresso' cultivars, which are characterized by similar growth vigor and the production recorded in the tree crown was 21.7-23.2 kg/tree, the trunk growth in 2024 ranged from 8.3 to 8.9 mm

Table 1

Development of trunk diameter in plum trees depending on the biological characteristics of the cultivar

Cultivar	Trunk diameter, mm		Trunk growth in 2024, mm	Trunk cross-sectional area, cm^2
	spring 2024	autumn 2024		
Pitestean (c)	78.8	87.8	9.0	60.5
Cacanska Najbolia	103.4	113.4	9.9	100.6
Empresso	88.1	96.5	8.4	72.9
Stanley	89.3	97.3	8.9	74.1
Blue Free	95.2	103.9	8.4	83.3
President	88.5	96.8	8.3	73.2
LSD 5%	3.8	4.3	-	-

The cross-sectional area of the trunk is directly correlated with the values recorded by the studied index. According to the cross-sectional area of the trunk, the cultivars studied in the seventh year of vegetation can be divided into four groups. The first group includes trees of the 'Pitestean' cultivar (60.5 cm^2), the second group includes those of the 'Empresso' (72.9 cm^2), 'President' (73.2 cm^2), 'Stanley' (74.1 cm^2), the third group includes the 'Blue Free' cultivar (83.3 cm^2), and the fourth group includes trees of the 'Cacanska Najbolia' cultivar (100.6 cm^2), where the largest cross-sectional area of the trunk was recorded.

Earlier flowering in the cultivars studied was recorded in the 'Cacanska Najbolia' and 'President' cultivars (05.04) (tab. 2). The temperature of 8.0-12.0 ^oC at night, 14.0-22.0 ^oC during the day, as well as the higher relative air humidity (40.0-68.0 %) influenced the number of fruits set in the trees of the 'Cacanska Najbolia' cultivar (751 pcs/tree), a cultivar that prefers cooler weather during the flowering period. The flowering of the trees of the 'Blue Free' cultivar began on 07.04.2024, and in those of the 'Empresso' cultivar on 09.04.2024. The 'Pitestean' and 'Stanley' cultivars are characterized by a later flowering period (10.04.2024). In fact, the flowering phenophase of the plum cultivars studied occurred over a period of 6 days.

Table 2

Influence of biological characteristics of plum cultivars on the phenophases of tree flowering and the beginning of harvesting in the northern part of the country, 2024

Cultivar	Date of onset of tree flowering phases				Harvesting time
	Start of flowering	Flowering 50%	Full bloom	Falling of petals	
Pitești̦ean (C)	10.04	12.04	15.07	19.04	22.07
Cacanska Najbolia	05.04	09.04	11.04	15.04	10.08
Empresso	09.04	12.04	14.04	17.04	13.08
Stanley	10.04	12.04	15.04	18.04	15.08
Blue Free	07.04	09.04	12.04	17.04	22.08
President	05.04	09.04	12.04	15.04	04.09

Studying how the flowering process manifested itself, we record that in the cultivars studied with different periods of precocity, 50 % of the flowers blooming in the crown of the trees manifested themselves at different stages. In practice, the cultivars 'Cacanska Najbolia', 'Blue Free' and 'President' recorded the respective degree of flowering on 09.04, but in the trees of the cultivars 'Pitestean, 'Empresso' and 'Stanley' this index was recorded on 12.04.

Full flowering in plum trees is considered when 100 % of the flowers in the multi-year wood and annual branches have bloomed. In the cultivars studied, the full flowering period coincided with 11 – 15.04, that is, it lasted for 5 days, a period characteristic for plum cultivars with early and medium flowering.

Petal fall refers to the period when the fruits have just formed and the basic tendency is to not allow their affection by abiotic and biotic factors. Petal fall in plum cultivars studied in the northern area of the country in 2024 occurred between 15 and 19.04, starting with the cultivars 'Cacanska Najbolia', 'President', continuing with 'Blue Free', 'Empresso' and ending with those from 'Stanley' and 'Pitestean'.

Among the plum cultivars studied, we note that earlier fruit ripening is characterized by the 'Pitestean' (C) cultivar (22.07), followed in sequence by the following cultivars: 'Cacanska Najbolia' (10.08), 'Empresso' (13.08), 'Stanley' (15.08), 'Blue Free' (22.08) and 'President' (04.09), meaning that these six cultivars were harvested on a 45-day sample.

The cultivars studied tied different amounts of fruits in the spring of 2024, from 370 to 815 pcs./tree. Lower values of the studied index were recorded in the trees of the 'Pitestean cultivar (370 pcs.), and higher values in those of the 'Cacanska Najbolia' (751 pcs.) and 'Stanley' (815 pcs.) cultivars. The 'President', 'Empresso' and 'Blue Free' cultivars formed 397; 407 and, respectively, 442 fruits in the crown of the trees.

The large amount of fruit obtained in the crown of trees of the 'Cacanska Najbolia' cultivar is explained by the favorable climatic conditions during the flowering, pollination and fertilization period, as well as the effectiveness of the 'Blue Free' and 'Pitestean' cultivars as pollinators for the respective cultivar.

The large amount of fruit in the crown of trees of the 'Stanley' cultivar is explained by higher self-compatibility, i.e. the cultivar being self-fertile binds a greater number of fruits compared to the 'President' (self-sterile) and 'Empresso' (partially self-fertile) cultivars, which require cross-pollination between them.

A lower value of the average weight of a fruit was obtained in the trees of

the 'Stanley' cultivar (36.8 g), and a higher value in those of the 'President' (54.7 g) and 'Empresso' (56.9 g) cultivars. The 'Pitestean', 'Blue Free' and 'Cacanska Najbolia' cultivars recorded average values of the studied index, constituting 47.3; 49.7 and, respectively, 50.6 g. According to the average weight, the cultivars studied are attributed to three groups of fruits by size: medium (30-40 g) to which the 'Stanley' cultivar is attributed, large (40-50 g) the 'Pitestean', 'Blue Free' cultivars and large (50-60 g) the 'Cacanska Najbolia', 'President' and 'Empresso' cultivars.

Table 3

Plum plantation productivity and fruit weight depending on the biological characteristics of the cultivar, 2024

Cultivar	Quantity of fruit, pcs/tree	Average fruit weight, g	Productivity		Difference from control, t/ha
			kg/tree	t/ha	
Pitestean (C)	370	47.3	17.5	11.7	0
Cacanska Najbolia	751	50.6	38.0	25.4	+13.7
Empresso	447	51.9	232	15.5	+3.8
Stanley	773	38.8	30.0	20.0	+8.3
Blue Free	442	49.7	22.0	14.7	+3.0
President	397	54.7	21.7	14.7	+2.8
LSD 5%	18,1	1.8	0.97	0.68	-

The quantity of fruits and their average weight constitute the production recorded within a tree, which is directly correlated with the value obtained per unit of area. Lower fruit production was obtained in the case of the 'Pitestean' cultivar, 17.5 kg/tree and 11.7 t/ha, respectively, which means we record a value of 60 % of the cultivar's potential. The 'President', 'Blue Free' and 'Empresso' cultivars produced average yields of 21.7; 22.0 and 23.2 kg/tree, respectively, with production per unit of area being 14.5; 14.7 and 15.5 t/ha, respectively. The 'Stanley' cultivar produced 30.0 kg/tree, and the 'Cacanska Najbolia' 35.0 kg/tree, which is the equivalent of 20.0 and 25.4 t/ha, respectively. The statistical data obtained demonstrate that an insignificant difference in the production of registered fruits is recorded only in the 'Blue Free' and 'President' cultivars, and in the other cultivars the influence is significant.

CONCLUSIONS

The 'Pitestean' cultivar recorded harvest maturity on 22.07, then followed at an interval of 18 days by the 'Cacanska Najbolia' cultivar (10.08), which subsequently continued staggered with the 'Cacanska Najbolia' (10.08), 'Empresso' (13.08), 'Stanley' (15.08), 'Blue Free' (22.08) and 'President' (04.09) cultivars. For a more rational efficiency of the use of labor during harvesting and a more staggered distribution of production, the period from late July to early August should be supplemented with 1-2 early plum cultivars.

Higher fruit production in the cultivars studied in 2024 per unit area was obtained for the 'Stanley' cultivar 20.0 t/ha and 'Cacanska Najbolia' 25.4 t/ha, and the 'President', 'Blue Free' and 'Empresso' cultivars formed average yields (14.5-15.5 t/ha), which are typical for intensive non-irrigated plum orchards in the country.

REFERENCES

Botu M. 2004. Pomicultura generală şi specială. Rmn. Vîlcea: CONPHYS, 329-341.

Butac M. 2010. Ameliorarea prunului. Universitatta din Pitesti; 101 p.

Butac M., Militaru M., Plopa C., Sumedrea M. 2015. Evaluation of some new plum cultivars for fresh consumption in correlation with consumer preferences. Fruit Growing Research, Vol. XXXI, 38-43.

Cimpoieş Gh. 2018. Pomicultura specială. Chişinău: Gologhraf-com, 147-173.

Cociu V., Botu I., Minoiu N., Pasc I., Modoran I. 1997. Prunul. Romania: Conphys, 434 p.

Juraveli A., Terentii P., Cozmic R. 2022. Genofondul prunului și rezultatele utilizării lui. Pomicultura, Viticultura şi Vinificaţia, nr. 2(88), 17-25.

Milatovic D., Durovicz ec D.G., Radovic A., Boskov D. 2019. Evaluation of late plum cultivars in the region of Belgrade (Serbia). Acta Sci. Pol. Hortorum Cultus, 18(1), 67–74.

Peşteanu A., Cumpanici A., Tocan P. 2023. Comportarea unor soiuri de perspectivă de prun în zona de sud a țării altoite pe portaltoiul Mirobalan 29C. Sectorul agroalimentar – realizări și perspective, Chişinău, 160-162.

Popa S., Cumpanici A., Braghiş A., Zbancă A., Rîbinţev I. 2019. Producerea prunelor. Manual tehnologic, Chişinău, 244 p.