

REALIZARI ȘI PERSPECTIVE LA CULTURA SPECIILOR POMICOLE SÂMBUROASE PE SOLURI NISIPOASE

ACHIEVEMENTS AND PERSPECTIVES ON STONE FRUIT GROWING ON SANDY SOILS

Anica Durău, Mihaela Croitoru, Milica Dima
Research- Development Center for Agricultural Plants on Sands Dabuleni, Romania

Abstract

Climatic conditions in the sandy soils of southern Oltenia encourage cultivation of tree species in terms of applying specific technologies. Possibility of poor sandy soils fertile capitalization, earliness in 7- 10 days of fruit ripening , high yields and quality are the main factors supporting the development of fruit growing in the sandy soils of southern Oltenia. The main objectives of the research were to CCDCPN Dăbuleni. Establish and improve stone fruit species assortment, adapted to the stress of the sandy soils, establishment and evaluation of the influence of stress on trees and their influence on the size and quality of production, development of technological links (planting distances, forms management, fertilization), getting high and consistent annual production of high quality, containing low as pesticide residues, to establish a integrated health control program of the trees with emphasis on biotechnical. Research has shown good stone species behavior, and their recommended proportion is 75% of all fruit trees (peach 36%, 14% apricot, plum 15%, sweet and sour cherry fruit growing 10% of the total area). Results on peach varieties revealed: 'Redhaven', 'Suncrest', 'Loring' with yields ranging from (24.8 t / ha to 29.0 t/ha) with maturation period from July to August, and varieties 'NJ 244', 'Fayette', 'Flacara' with productions ranging from (19.7 t / ha to 23.0 t/ha) with maturation period from August to September. The sweet cherry varieties 'Van', 'Rainier', 'Stella', with yields ranging from 17. 2 to 24.4 t / ha. In the range studied sour cherry were found 'Oblacinska' varieties of 11.0 t / ha, 'Cernokaia' with 10.5 t / ha, 'Schatten Morelle' with 9.1 t / ha. Optimum planting density and shape of the peach crown found that the highest yields of fruit are produced in the form of vertical cordon crown, with values ranging from 15.9 t / ha at a distance of 2 m, 10.3 t / ha at a distance of 2.5 m and 7.9 t / ha at a distance of 3 m, the distance between the tree rows is 4m. Need for organic and mineral fertilization, and the effectiveness of micronutrients with bor established optimum fertilizer doses on fruit peach, (40-60 t / ha manure and N100P80 K100). Biochemical composition of fruit parameters is comparable with that obtained in other fruit growing areas in the country. Cherry and cherry fruit under sandy soils accumulate much larger quantities of total drymatter, carbohydrates and C vitamin compared with apricot and peach fruit.

Keywords: sandy soils, varieties, densities, fertilization

Cuvinte cheie: soluri nisipoase, soiuri, densități, fertilizare

1. Introduction

Opportunity of sandy soils unsuitable for some cultures, the need to supply with fruit and earliness are several factors which advocates for development of fruit growing on these soils.

Rich thermal resources coupled with strong sunstroke plus irrigation during periods of drought are elements that have a positive effect on tree species on sandy soils.

On sandy soils in southern Oltenia stone species (peach, apricot, cherry) give the best results. In this regard had to be given attention to maintaining and even increasing culture surfaces by applying appropriate technologies and of course the continuous improvement of assortment to increase fruit quantity and quality.

On sandy soils orchards were established mainly on these with the organic matter content up to 0.7%. Research has revealed high adaptability and production capacity of stone species (Cociu. V. et al., 1981; Antonia Ivascu, Viorica Balan, 1991, Antonia Ivascu, Bereșiu Ileana, 1994; Antonia Ivascu, Murvai Monica, Elena Popa, 1993).

A basic factor for the growth and fruitfulness of trees grown on sandy soils is the concern to preserve and increase the level of fertility of these poorly fertile soils .

Choosing assortment of fruit species with high suitability to ecopedological conditions, establishing appropriate technological links is essential in getting secure and stable fruit production, (Antonia Ivascu 1991, 1992, Cociu V., 1993, Antonia Ivascu, Ionescu P, Dumitru Liliana, 1997).

2. Material and methods

The research was conducted at CCDCPN Dăbuleni a collection of species stone fruit growing and fruit growing field of agricultural technique in peach. Agrotechnics applied in the test plots was developed by Dăbuleni CCDCPN for each species. Soil that were located experiences is a typical anthropogenic erodisol covering a clay soil is poor iluviar lamellar freatic. Fertiliy, humus content ranging from 0.18% to 0.58%, the total nitrogen 0.021 to 0.032%, P 12-32ppm, K-Al 27 31.9 ppm.

Reaction is slightly acid to neutral soil pH from 6.5 to 6.0.

3. Results and Discussions

Climatic factors with the greatest influence on successful culture of fruit trees on sandy soils are light, temperature, rainfall.

Duration of sunshine plays an important role not only in photosynthetic activity of trees but also the key factor in triggering a chain of biochemical and physiological processes.

The average yearly temperature is 11.8 °C, 43.5 °C absolute maximum and absolute minimum of -30.5 °C.

Rainfall recorded in the sandy soils were unevenly distributed over the year and variations from year to year.

Research has shown good behavior of stone species, as their recommended proportion is 75% of all fruit trees (peach 36%, 14% apricot, plum 15%, sweet and sour cherry and cherry fruit growing 10% of the total area. (table 2)

Results on the range of peach and fruit production have highlighted particular value production to varieties Redhaven, Suncrest, Loring (29.0 to 24.8 t / ha) with maturation period from July to August, and the varieties NJ 244, Fayette, Fillette, Flacara (from 23.0 to 19.7 t / ha) with maturation period from August to September (table 3).

Nectarines culture results on sandy soils have highlighted a number of varieties, noted by earliness, production and fruit quality (9, 8, 10 Nectared, Fantasia) (table 4).

At apricot varieties were introduced of group selection early varieties (Saturn, Neptune, NJA 42) of medium and late season (Mamaia, Sulina, Selena, Silvana, Commander, Neptune) (table 5).

There were revealed cherry varieties: Van, Rainier, Stella Boambe Cotnari with productions between 17.2 and 24.4 t / ha (table 6).

In terms of production, the best were sour cherry varieties: Oblacinska 11.0 t / ha Cernocaia 10.5 t / ha Schatten Morelia 9.1 t/ha (table 7).

Biochemical composition of fruits parameters is comparable with fruit from other areas of culture.

Sweet and sour cherry fruit under sandy soils accumulate greater quantities of dry matter, carbohydrates and C vitamin, compared with apricot and peach fruit (table 8).

On sandy soils of southern Oltenia fruit maturation occurs 10 days earlier than other areas of culture in the country, but which is lost in quality is wonned earliness.

The findings obtained from apricot showed that the largest fruit production was obtained in the variant fertilized with manure once 30t/ha every 3 years + N100 P80 K100 (table 9).

It was found that the largest fruit production was obtained in the form of vertical cordon crown at all distances studied, with values between 15.9 t / ha at a distance of 2m, 10.3 t / ha at a distance of 2.5 m and 7.9 t / ha at a distance of 3m (table 10).

The results have highlighted the positive effect of organic and chemical fertilization on fruit production.

The largest fruit production were obtained from organic fertilization with manure 40-60 t / ha dose and of mineral fertilization N100 P80 K100, values ranging between 9.3 to 9.6 t / ha (table 11).

At peach by fertilization with foliar fertilizer dose of 5l/ha both for Folibor and Bor complex production increases statistically highly significant (4.1 t / ha compared to unfertilized control variant) (table 12).

In sour cherry, the production results obtained by fertilization with chemical fertilizers, green and organic as compared to unfertilized, all variants were very significant increased, the highest values were obtained with chemical fertilization N200 P160 K200 (7.6 t / ha for variety Nana and 8.6 t / ha in variety Oblacinska) (table 13).

Regarding the influence of chemical fertilization to sweet cherry, organic green compared to unfertilized found that all variants have achieved very significant production increases, but the highest values were obtained from chemical fertilization with N200 P160 K200 (5.3 t / ha for cultivar Van and 7.5 t / ha Boambe de Cotnari) (table 14).

In strategy development of orchards on sandy soils should be considered the following:

- Increases surfaces by creating new tree plantations of peach, apricot and cherries;
- Establishment of comparative culture area of cherries, plum, peach and apricot assortment for in early maturing varieties that efficiently use ecopedological conditions offered by the sandy soil;

- Increased share of early varieties with high production potential from all species;
- The choice of 2-3 varieties of the best quality fruit suitable to meet EU market requirements and standards;
- Creation, extension and generalization of productive varieties cultivars with resistance to drought, pests and pathogens attack with a high potential for adaptability to sandy soils;
- Develop and promote appropriate technologies to obtain organic fruit, in order to improve consumer health and quality of life, environmental protection and rural development.

4. Conclusions

1. Research has shown good behavior of stone species and their recommended proportion range of 75% of all fruit trees (peach 36%, 14% apricot, plum 15%, sweet and sour cherry 10% of the total area).
2. Results on the range of peach varieties revealed: Redhaven, Suncrest, Loring with productions ranging from (29.0 to 24.8 t / ha) with maturation period from July to August, and varieties NJ 244, Fayette, flame with productions ranging from (23.0 to 19.7 t / ha) with maturation period from August to September.
3. The sweet cherry varieties Van, Rainier, Stella, with yields ranging between 17.2 and 24.4 t / ha.
4. Out of all studied sour cherry varieties, were pointed out Oblacinska with 11.0 t / ha, Cernokaia with 10.5 t / ha, Schattenmorelle with 9.1 t / ha.
5. Form of crown is an essential element of the agrotechnics from which depends the productivity of the tree, and maintainand of productive capacity on the period of the orchard.
6. Form of crown vertical cord for all distances of planting, easy of achieved and maintaining, was adequate.
7. In the conditions of sandy soils the best production of fruits to peach tree was obtained by fertilization with 60t/ha manure and chemical fertilization with N100 P80 K100.
8. The better system of keeping the soil in the orchards from the sandy soils is the dead-fallow.
9. The best variant of foliar fertilization is one with Folibor in doze of 5l/ha.

5. References

1. Antonia Ivaşcu, Viorica Bălan, 1991. New assortment of nectarin recommended for the southern zone României. Horticultura nr 7-8.
2. Antonia Ivaşcu, Bereşiu Ileana, 1994. Researches concerning the of a behavior kinds of fated peach trees of the industry. Scientific works ICPPP Piteşti Analele vol XI 1994.
3. Antonia Ivaşcu, Murvai Monica, Popa Elena, 1993. The behavior to of a frost kinds and hybrids of nectarin in the conditions of the zone Bucureşti. Scientific works USAB.
4. Antonia Ivaşcu, 1991. Noi orientations in the culture of the peach tree in România. Horticultura nr . 5
5. Antonia Ivaşcu, 2002. We rediscover the peach tree. The publishing house UNIVERSITAS COMPANY-BUCUREŞTI.
6. Cociu V., 1993. The culture of the peach tree in house-keeping Editura Ceres
7. Cociu V., Mihăescu G, Mănescu Creola, Lenina Valentina, 1981. The culture of the peach tree. The publishing house Ceres Bucureşti.

Table 1. Main climatic elements in Dabuleni

Climatic element	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Average annual temperature (°C) (1956 – 2008)	2.2	1.8	6.5	11.9	17.3	21.3	23.0	22.4	17.4	12.3	4.67	0.4
Tabsolete maximum temperature (°C)	19.6 2007	23.0 1989	28.9 1983)	34.7 1998	37.5 1993	43.3 2007	43.5 2007	40.4 2006	38.2 1968	34.8 1991	28.8 1989	20.5 1957
Absolute minimum temperature (°C)	-30.5 1963	-23.2 1956	-16 1963	-2.5 2003	1.0 2000	5.8 1962	8.5 1987	6.0 1961	-2.2 1977	-6.8 1987	-20.0 1993	-20.9 1962
Multi rainfall (1956-2008)(mm)	26.01	28.26	25.96	44.25	46.03	53.18	54.62	40.42	47.98	33.22	33.12	44.3

Table 2. Fruit assortment structure on sandy soils

Stone fruit	75.00%	Pome species	23%	Shrubs	2.00%
Peach	36.00%	Apple for summer	21%		
Apricot	14.00%	Pear	1%		
Plum	15%	Quince	1%		
Sweet and sour cherry	10%				

Table 3. Production and ripening period of some varieties of peach grown on sandy soils

Variety	Fruit production (t/ha)	Maturation period
Redhaven	29.0	27.VII - 14.VII
Suncrest	25.9	10.VIII - 16.VIII
Loring	24.8	9.VIII - 21.VIII
N.J. - 244	23.0	29.VIII - 6.IX
Fayette	21.6	2.IX - 9.IX
Fillette	20.9	24.VII - 14.VII
Juli Elberta	19.7	6.VIII - 26.VIII
Maygold	17.6	20.VII - 28.VII
Delicious	17.6	25.VIII - 31.VIII
Collins	16.8	29.VII - 13.VII
H.I. - 14	16.7	3.VIII - 15.VIII
Flacăra	14.4	4.IX - 17.IX
Precoce Morettini	13.1	30.VI - 26.VII
Springcrest	11.0	4.VII - 6.VII
Rauger	10.3	1.VIII - 15.VIII

Table 4. Fruit production and ripening period of some varieties of nectarines

Variety	Fruit production (t/ha)	Maturation period
Nectared 9	25.1	28.VIII - 14.IX
N.J.N. - 56	21.2	26.VIII - 11.IX
Nectared 6	21.1	11.VIII - 26.VIII
Nectarose	19.6	8.VIII - 25.VIII
Nectared 8	16.2	25.VIII - 11.IX
Nectared 10	15.8	7.IX
Nectared 4	13.4	30.VII - 10.VIII
Nectared 2	10.3	12.VII - 8.VIII
Fantasia	10.1	2.IX - 5.IX

Table 5. Production of some apricot varieties grown on sandy soils

Variety	Fruit production (t/ha)
N.J.A. - 42	24.0
Neptun	20.4
Saturn	28.8
Mamaia	23.6
Excelsior	24.3
Silvana	24.4
Callatis	28.5
Umberto	19.0
Sulina	22.2
Sirena	27.9
Selena	11.6
Sulmona	22.2
Comandor	25.4
Olimp	20.6

Table 6. Fruit production of some sweet cherry varieties grown on sandy soils

Variety	Fruit production (t/ha)
Van	24.4
Rainier	22.2
Stella	19.4
Ulster	18.3
Vista	17.2

Table 7. Fruit production of some sour cherry varieties grown on sandy soils

Variety	Fruit production (t/ha)
Oblacinska	11.0
Cernookaia	10.5
Montmorency	9.8
Richmorency	9.4
Schatten Morelle	9.1
Swindiche Glas	8.9
Topolog	6.8
Focșani	6.8

Table 8. Biochemical composition of stone fruit species grown on Dabuleni sandy soils

Species	Total dry matter (%)	Water (%)	Soluble substance (%)	Total carbohydrates (%)	Total acidity%	Vitamin C mg /100g sp
Peach	12.04	87.96	10.90	8.21	0.60	4.55
Apricot	13.86	86.14	12.89	8.60	1.52	4.83
Sweet cherry	16.08	83.92	15.06	14.62	0.78	9.46
Sour cherry	15.46	84.54	13.72	9.64	2.08	11.48

Table 9. Influence of fertilization, on fruit production in apricot(Royal variety) grown on sandy soils in southern Oltenia

Fertilization variant	Fruit production t/ha)
NOPOK0 (Mt.)	5.17
N100P80K100	8.68***
30t/ha manure every 3 years	8.01**
30t/ha manure every 3years +N100P80K100	9.48***

DL 5%= 1.33 t/ha; DL 1%= 2.01 t/ha; DL 0,1%= 3.2 t/ha

Table 10. Production at Redhaven peach variety depending on distance and tree crown shape

Plating distance/ row	Shaped crown	Production t/ha	Relative production %	Diferention against witness t/ha	Semnification
2 m	Vertical cord	15.9	123.25	3.6	*
	Spindle bush	13.7	106.20	2.4	
	Palmeta flat (Mt)	12.3	100.00	0	
2,5m	Vertical cord	10.3	128.70	2.3	*
	Spindle bush	9.0	112.50	1.3	
	Palmeta flat(Mt)	8.0	100.00	0	
3m	Vertical cord	7.9	175.50	3.4	*
	Spindle bush	5.3	117.70	0.8	
	Palmeta flat(Mt)	4.5	100.00	0	
DL5%				2.37	
DL1%				4.74	
DLO,1%				6.69	

Table 11. Production at Redhaven peach variety, depend on organo mineral fertilization system

Dose of organic fertilizer	Dose of chemical fertilizer	Production t/ha	Relative production %	Diferention against witness t/ha	Semnificatio n
20 t/ha manure	N0P0K0	5.5	100.00	0	Mt
	N50P40 K50	7.0	127.27	1.5	*
	N100 P80 K100	7.2	130.90	1.7	**
40 t/ha manure	N0 P0 K0	6.6	100.00	0	Mt
	N50 P40 K50	8.7	131.81	2.1	**
	N100 P80 K100	9.3	140.90	2.7	***
60 t/ha manure	N0 P0 K0	7.4	100.00	0	Mt
	N50 P40 K50	9.4	127.02	2.0	**
	N100 P80 K100	9.6	129.72	2.2	***
DL5%				1.08	
DL1%				1.52	
DI0,1%				2.15	

Table 12. Influence of foliar fertilization with boron fertilizers on fruit production in peach

Foliar fertilization variant	Production t/ha	Relative production%	Diferention against witness t/ha	Semnification
Unfertilized witness	8.3	100.0	0	Mt.
Boric acid 0,15%	8.9	106.5	+0.55	-
Folbor B, 5 l/ha	10.4	125.0	+2.10	*
Folbor standard, 5 l/ha	12.4	148.0	+4.10	***
Cupribor 5 l/ha	11.2	134.6	+2.90	**
Bor complex 5 l/ha	12.4	148.0	+4.10	***

DL 5% = 1.65 t/ha ; DL 1%= 2.29 t/ha; DL 0,1% = 3.16 t/ha

Table 13. Influence of fertilization on fruit production in some varieties of sour cherry

Variety	Fertilization variant	Production t/ha	Diferention against witness t/ha	Semnification
Nana	N0P0K0 (Mt.)	4.8	0	
	N100P80K100	7.6	2.8	***
	N200P160K200	12.4	7.6	***
	N250P200K250	11.7	6.9	***
	Green manure	8.0	3.2	***
	Manure 30t/ha	10.1	5.3	***
Oblacinska	N0P0K0 (Mt.)	6.0	0	
	N100P80K100	8.9	2.9	***
	N200P160K200	14.6	8.6	***
	N250P200K250	13.7	7.7	***
	Green manure	8.6	2.6	***
	Manure 30t/ha	11.6	5.0	***

DL 5% = 1.48 t/ha; DL 1% = 1.99 t/ha; DL 0,1% = 2.6 t/ha

Table 14. Influence of fertilization on fruit production in some sweet cherry varieties

Variety	Fertilization variant	Production (t/ha)	Diferention against witness t/ha	Semnification
Van	N0P0K0 (Mt.)	3.3	0	Mt
	N100P80K100	4.7	1.4	**
	N200P160K200	8.6	5.3	***
	Green manure	6.7	3.4	***
	Manure 30t/ha	7.3	4.0	***
Stella	N0P0K0 (Mt.)	4.7	0	Mt
	N100P80K100	6.3	1.6	***
	N200P160K200	7.6	2.9	***
	Green manure	6.3	1.6	***
	Manure 30t/ha	5.8	1.1	*
Boambe de Cotnari	N0P0K0 (Mt.)	5.1	0	Mt
	N100P80K100	9.4	4.3	***
	N200P160K200	12.6	7.5	***
	Green manure	8.5	3.4	***
	Manure 30t/ha	8.1	3.0	***

DL 5%= 0.8 t/ha; DL 1% = 1.34 t/ha; DL 0,1% = 1.63 t/ha