Researches concerning the selection of some nectarine varieties as genitors for the breeding program in Romania

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Introduction

The nectarine, the natural spontaneous mutation of the peach represents an important income source for the growing countries (USA, Italy, France, Spain, Greece); nectarine tree growing stands on one of the first places as far as profitability is concerned, thanks to the outstanding taste, appearance and aroma of the fruits.[4]

The rapid extension of this tree in the last 6–8 years, across all the peach tree growing areas, as reported from all over the world, is dependent not only on the remarkably appealing commercial appearance, but also on the fruiting precocity, yield, pest [5] and transportation resistance, characteristics that are greatly bred in the latest cultivars.

Since most of the already existent cultivars in Romania are of Californian origin, that is created for a climate with short and warm winters, they can hardly adapt themselves to the adverse climatic conditions of our country; this is a reason why the present variety range has to be thoroughly studied and improved by new cultivars better matched to the local conditions in our country.

Ecological conditions

The experiment was conducted on a forest brown – reddish soil, characteristic to the sylvan – steppe area, loesslike, loamy, slightly acid pH (3.8) in the topsoil.

The climate is temperate, mediteranean like with dry summers.

Increased aridity index of 28.1. The area also features the highest sunpower resources range from 125 to 135 kcal/sq.cm/year; sunshine average is of 2,200 to 2.400 hours; yearly average temperature: 10.0 to 11.5 degrees C; the global thermic resources are 4.100 to 4.300 degrees C.

Rainfall records show 350–700 mm. The area also faces frequent frosts and thows in February, with the lowest temperature of –35 °C; summers have 3 to 4 hot months, droughty months with temperatures rising to +44 °C; max. rainfalls in June and fewest in August – October.

Material and method

The selection of the most valuable nectarine genitors began at SCPP Baneasa in 1986, on a competition plot of 55 cultivars and hybrids of various geographic origins. We tried under Romanian conditions Arkansas nectarine hybrids created by James Moore for diseases resistance and some Canadian hybrids obtained by R.C. Layne in Harrow Research Station.

The research activity had in view the manner the cultivars and hybrids adapted themselves to the pedoclimatic conditions in the area, the phenologic study of the vegetative and reproduction organs, the study of blossoming biology, mainly cultivar behaviour in the free, controlled and self – pollinating process, the study of the cultivar yield and fruit quality, the frost and temperature oscillations resistance *(Capellini* et al, 1985, *Ivascu,* 1997) as well as main pests and processability resistance.

Results and discussions

All these aspects were approached with respect to the climatic conditions existent during 1986 through 2000. The triggering and pursuing of the vegetative and fruiting phenophases, mainly conditioned by the genetic features of the cultivars and secondly by the climatic evolution, show that with most of the cultivars and hybrids under study vegetative buds swell between 26-th March and 10-th of April.

As blossoming buds are concerned, buds burst between April 1-st and April 20-th, while blossoming between 6-th and 28-th of April.

The cultivars Crimsongold, Romamer 1, Romamer 2, Harko, ARK 139, Flavortop and Fairlane feature late blossoming, proving to be genitors for highly resistant to spring temperature fluctuations.

The data picked evidential that, except for the Rhonegold cultivar, that is self – sterile, all the other cultivars and hybrids are self – fertile, high percentages (over 80%) being evident in ARK 125, Independence, Pocahontas, Romamer 2, HFSR3P4, ARK 114, Hardyred.

Increased germinating capacity (over 35%) was recorded in the pollen samples of NJN 21, Morton, Flavortop, NJN 58, ARK 125, ARK 139.

The picking maturity of the nectarine cultivars and hybrids was sequenced from July 4 (Crimsongold) to August 28 (Fantasia).

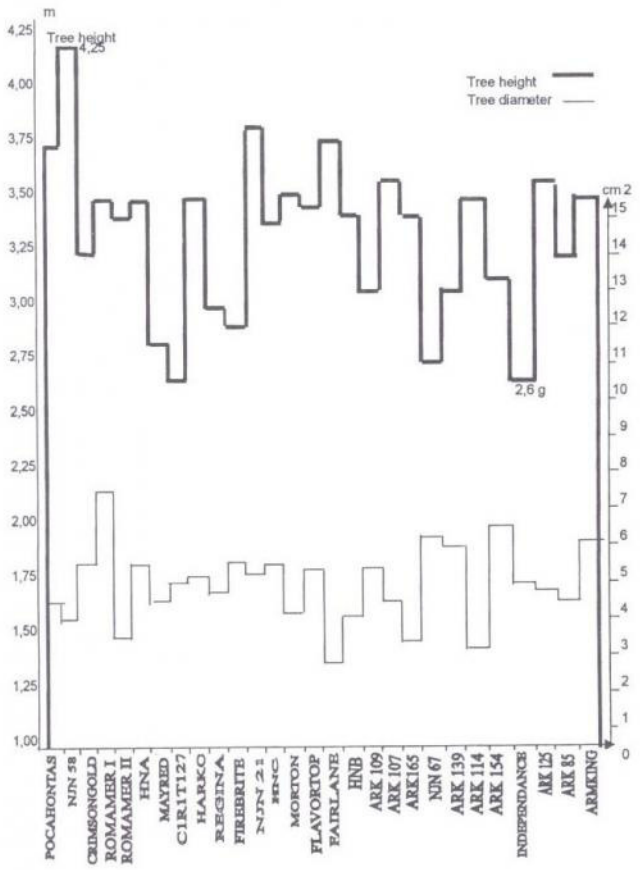

Figure 1 Tree vigour in some nectarine cultivars and hybrids aged 5

Although considered as one of the causes of the restricted growing of the nectarine tree, the yield at the Research Station Baneasa (planting spacing 4/3 m, density 833 trees/ha) proved to be a very good one in the case of certain cultivars and hybrids. For the early ripening period the yield was 10 t/ha (statistical records) for ARK 125 and Crimsongold, while for the average and late ripening cultivars, ARK 114, ARK 134, ARK 109, ARK 104 the yield was of more than 21 t/ha.

Among the basic elements in selecting the nectarine genotypes the fruiting precocity (they bore fruit the first year after planting) at: Harko, Crimsongold and Romanian hybrids HCR6P21, PSR17P26.

Another important element in setting – up super – intensive tree plantations is tree vigor; low vigor trees that have been selected by us are: ARK 125, HCR3P8, HSCR1P11, ARK 114, Nectared 10, ARK 90, NJN 58, Fantasia and Weinberger *(Fig. 1)*.

Important loss of fruiting buds were recorded under the hard conditions of 1987/1988 winter, when the absolute minimum was of –22 °C and the branches stayed under granulated, persistent hoar for 15 to 17 days, a fact that caused tissue asphyxia and even branch wounds. Under these conditions, after very rigorous selections, the following cultivars showed remarkable frost resistance: Crimsongold, ARK 114, ARK 125, Harko, Independence, NJN 21.

To find out main disease resistance genitors observations were carried forth on natural pests that affect the nectarine tree: *Monilia laxa, Taphrina deformans, Sphaerotheca pannosa* var. *persicae, Cytospora cincta, Stigmina carpophillum, Pseudomonas syringae* pv. *syringae,* micoplasms and also artificial infections both on the sprouts and leaves and on the fruits.

After tests on the biologic material the following cultivars tolerant with *Cytospora cincta* and *Stigmina carpophillum* were found: Independence, Romamer 2, ARK 125, ARK 134, Anderson.

The Nectared 10 cultivar was detected as resistant against the attack of *Monilia laxa* and *Sphaerotheca pannosa* var. *persicae* fungi. As concerns bacterial resistance, good behavior was evident in: Fantasia, ARK 134, NJN 21, HCR3P8.

From the point of view of fruit quality, the following have been selected: ARK 139, Regina, Crimsongold, Romamer 1, ARK 125, ARK 134 *(Fig. 2)*.

All the chemical characteristics of the fruits have been studied in order to find the quality genitors *(Ivascu,* 1993); outstanding through their content in sugar, vitamin C and the balanced ratio between sugar/acidity, the following cultivars and hybrids were remarcable: NJN 68, Flavortop, ARK 141, Morton, Romamer 1, Harko, Fantasia, ARK 139.

The breeding program started with analysis of the existent phenotypes, genitors selection respect of the phenotype and diallele hybridations between the selected genitors.

Through these breeding methods we tried to improve the productive genetic level, closely related to frost and pest resistance, self – compatibility or compatibility to other cultivars.

These features ensure higher adaptability to the ecologic conditions meaning the widening of the nectarine growing area .

The genitors below were selected to attain the first stage objectives.

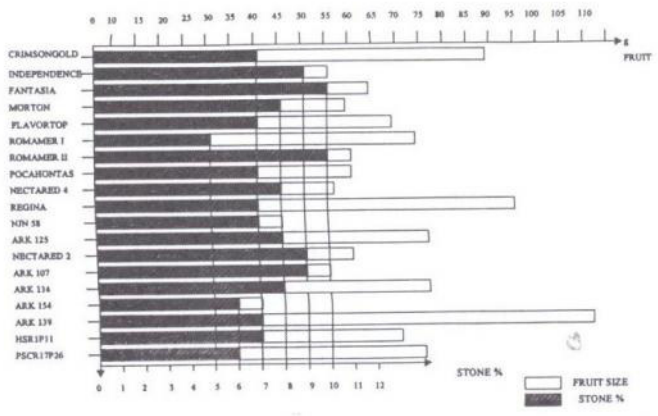

Figure 2 Fruit size and stone % in some nectarine cultivars in competition plots (Average 1988–2000)

Maternal genitors

Crimsongold – yield, fruit quality; Independence – pest and frost resistance, yield; Fantasia – tardiness, quality; Romamer 1 – yield, earliness; Morton – fruit quality, good aroma; NJN 21 – pest resistance, fruit quality; Harko – frost resistance, yield; ARK 107 – frost resistance, pest resistance; Nectared 10 – tardiness, fruit quality.

Paternal genitors

ARK 125 – yield, pest resistance, low vigour; ARK 139 – late blossoming, fruit quality; Regina – remarcably appealing commercial appearance; NJN 68 – high content of dry substance and vitamin C; Nectared 10 – *Monilinia*, mildew resistance, low vigour. Crimsongold – frost resistance: ARK 114 – temperature oscillations resistance, yield.

Crossing are based on the previously shown characteristics to attain the set targets:

1. Late blossoming x quality fruit	ARK 154 x Nectared 4
2. Frost resistance x quality fruit	Hardyred × Fairlane Harko x NJN 58
3. Rest resistance × quality fruit	Crimsongold × Independence NJN 21× Independence ARK 107 × Crimsongold
4. Yield × fruit quality	ARK 125 × Regina PSCR17P26 × Mayred ARK 125 × NJN 58
5. Yield × earliness	Crimsongold × SR1P11
6. Low vigour × frost resistance	HNB × Harko
7. High content of dry substance × temperature oscillation resistance	NJN 58 × Independence
8. Frost resistance × late maturity	Hardyred × HFSR3P4
9. Late maturity × yield	Fantasia × Romamer 2
10. High degree of self – compatibility × precocious fruiting	ARK 151 ARK 151 × PSCR17P26

Fruiting % ranges from 1.6% (Regina x Mayred), through 7.8% (Fantasia × Independence), 10.3% (Crimsongold × Hardyred), 10.9% (Crimsongold × ARK 85), 11.9% (ARK 141 × NJN 237) 12.5% (C1R1T127 × Harko) to 90.0% (Mayred × HSR1P11), 91.0% (Flavortop × Hardyred), 91.2% (Harko × HSR1P11), 91.6% (ARK 145 × Flavortop), 92.5% (ARK 109 × NJN 58), 93.5% (Morton × Pocahontas), 95.5% (Flavortop × Fairlane), 95.7% (Nectared 2 × Regina), 9.6% (Nectared 2 × Independence) to 96.1% (HNC × ARK 107).

Both maternal and parental quality genitor ensure increased fruiting rates (over 50%), better than the best pollinater, Crimsongold cultivar.

Conclusions

Following the observations and analysis pursued at the Research Station for Fruit Trees Growing -Baneasa, the following can be considered as genitor sources in Romania:

- for pest resistance – bacterial death – resistance – Crimsongold, Flavortop, Independence, Harko, Fantasia, Nectared 4, NJN 58; *Taphrina deformans* resistance – Crimsongold, Fairlane; Virus resistance – Nectared 4, Nectared 6, Nectared 8; *Cytospora cincta* resistance – Pocahontas,Harko, Nectared 2; *Monila* resistance: Nectared 3, Nectared 10, Flavortop;
- for frost and temperature oscillations resistance: Harko, Hardyred, Crimsongold, Independence;
- for high dry substance content: Morton, Fantasia, Firebrite, Independence, Harko, Flavortop;
- for high – sized fruit: Crimsongold, Firelane, Rubygold, Regina;
- for high and steady yield: Crimsongold, Pocahontas, ARK 134, ARK 125, Independence;
- for early maturity: Crimsongold, Maria Laura, Maria Emilia;
- for late maturity: Fantasia;
- for fruiting precocity: Crimsongold, Fantasia, Nectared 2, Flavortop, ARK 145, ARK 139;
- for increased self-fertility: ARK 125, Independence, Pocahontas, Romamer 2, Hardyred, NJN 58;
- for high photosynthesis capacity: Crimsongold, ARK 125, Independence, Pocahontas, NJN 21.

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