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SUITABILITY EVALUATION OF SEVERAL APPLE CULTIVARS FOR ORGANIC FRUIT PRODUCTION

Alojzy Czynczyk, Augustyn Mika, Paweł Bielicki and Adam Krawiec

Research Institute of Pomology and Floriculture
Pomologiczna 18, 96-100 Skierniewice, POLAND
e-mail: aczynczyk@insad.pl

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A B S T R A C T

Suitability of nine scab-resistant or partially scab-resistant apple cultivars: 'Bohemia', 'Rubinola', 'Topaz', 'Goldstar', 'Pinova', 'Redkroft', 'Free Redstar', 'Melfree' and 'Gold Milenium' ('Early Freegold') for organic orchards was evaluated during the period 2002-2006. The experiment was set up in the spring of 2002 and consisted of two plots. In the first plot, no plant protection chemicals were applied either to the trees or to the soil. In the second plot, with limited spraying programme, only those compounds that are allowed to use in organic fruit production were applied in order to control pests and diseases: copper products three times; "Carpovirusine Super SC" and garlic extract "Liquid Bioczos" one time. Young shoots infested by apple mildew and aphids were cut back. After planting, the ground under tree rows was mulched with agricultural spun-web, linen residue felt or a sawdust in a 1.2 metre wide strip. Grass was allowed to grow between the rows and was regularly mown. During the years of the experiment, many trees were seriously infected by apple canker (*Nectria* sp.), what caused the loss of certain number of them. Trees planted in mulched soil with agricultural spun-web grew better and bore more fruit in comparison with the trees grown in linen residue felt and sawdust mulch. The highest yield was obtained from cultivars 'Gold Milenium', 'Pinova', 'Melfree' and 'Topaz'. The cultivars 'Topaz', 'Bohemia', 'Rubinola', 'Redkroft' and 'Gold Milenium' proved to be the most suitable for organic fruit production. The greatest problem was aphid control. Cutting back shoots with primary infestation was the most promising method.

Key words: organic fruit production, apple, scab-resistant cultivars, susceptibility to apple cancer, tree vigor, yielding

INTRODUCTION

Scab-resistant and partially scab-resistant apple cultivars are gaining popularity in the European Union. The taste and attractiveness of new scab-resistant cultivars selected in the last few years is much better than of the cultivars such as 'Prima', 'Priam' and 'Priscilla', which were bred earlier in the USA and France (Dayton et al., 1970; Williams et al., 1972; Decourtye et al., 1974). Production of scab-resistant apple trees in Polish nurseries achieved about 90 thousand trees in 2006. The most popular cultivars are 'Rubinola' (18.3 thousand), 'Topaz' (17.2 thousand), 'Novamac' (11.3 thousand) and 'Sawa' (11.0 thousand). In the years to come, the share of scab-resistant cultivars in commercial orchards will increase because some of them, like 'Topaz', 'Novamac', 'Freedom' and 'Gold Milenium', will be planted in orchards to produce fruit for processing. Spraying programme in these orchards will be reduced (Niemczyk, 2000). Other attractive and accepted by consumers cultivars are 'Rubinola', 'Ariva', 'Rajka', 'Bohemia' and 'Florina', which can be planted in home gardens and grown with minimal controlling of diseases. The aim of this trial was to select the scab-resistant cultivars which could be recommended for organic fruit production in commercial orchards.

MATERIAL AND METHODS

The experiment was set up in the spring of 2002 at the experimental orchard of the Institute of Pomology and Floriculture, situated in Skierniewice in central Poland. Nine of scab-resistant or partially scab-resistant apple cultivars were included in the trial. The evaluated cultivars were: 'Bohemia', 'Rubinola', 'Topaz', 'Goldstar', 'Pinova', 'Redkroft', 'Free Redstar', 'Melfree' and 'Gold Milenium'. After planting, the first six cultivars were mulched with agricultural spun-web, linen residue felt or a sawdust in a 1.2 metre-wide strip. Last three cultivars grafted on M.9 were mulched also with agricultural spun-web.

The trial was set up in randomized block pattern with four replications and three trees per a plot. Two-year-old trees grafted on M.9 rootstock were planted in a podsolic soil overlaying light clay, where for over fifty years fruit trees were grown. All trees were planted 3.40 x 1.35 metre apart and trained as slender spindles.

The experimental field was divided into two parts. In the first one, no chemicals were applied either to the trees or to the soil. In the second part, with limited spraying programme, only these plant protection compounds which are allowed to use in organic fruit production were applied in order to control pests and diseases. Following chemicals were used: copper products three times, "Carpovirusine Super SC" and garlic extract "Liquid Bioczos" one time. Young shoot infested by apple mildew and aphids were cut back to limit the spread of these agrophages. After planting, the ground under tree rows was mulched either with agricultural spun-web, linen residue felt or a saw-

dust in a 1.2 metre-wide strip. In 2006, all trees were mulched with farm yard manure on earlier mulched rows. Grass was allowed to grow between the rows and was regularly mown. Weeds, if appeared in the rows, were also mechanically mown. No mineral fertilization was ever applied to any part of the orchard. The following measurements were performed: tree trunk circumference was measured 30 cm above the ground level and converted to trunk cross-sectional area. The yield of fruit per tree and the mean fruit weight were recorded every two years. All fruit were taken from 3-4 representative tress in each plot to evaluate the mean fruit weight. Fruit weight was assessed using the electronic sorting machine manufactured by Greef. Results were statistically elaborated by analysis of variance, followed by Duncan's multiple range test at $p = 0.05$.

RESULTS AND DISCUSSION

Tree health

During the five-year period (2002-2006) of tree growth, there was no loss of trees caused by winter frost either root system or the part of the tree above ground. In the same period, some trees died due to serious apple tree canker (*Nectria* sp.) infection that occurred on trunk and branches. The highest number of lost trees was recorded among cultivars 'Rubinola', 'Topaz' and 'Redkroft'. Among cultivars 'Pinova', 'Free Redstar', 'Melfree' and 'Gold Milenium' no losses were recorded (see Tab. 1). The number of trees infected by canker was very similar in both plots. The highest number of infected trees was noticed among cultivars 'Goldstar', 'Topaz', 'Pinova', 'Redkroft' and 'Rubinola'.

Table 1. The number of lost and infected trees (out of 12) due to apple canker (*Nectria* sp.) and mean size of bark necrosis in 2006

Cultivar	Number of trees lost due to infection by canker		Number of infected trees		Mean size of necrosis on infected trees [cm^2]	
	no protection	limited protection	no protection	limited protection	no protection	limited protection
Bohemia	1	1	5	4	15.33	10.83
Rubinola	2	3	5	6	59.75	81.76
Topaz	3	2	8	7	22.54	34.00
Goldstar	2	0	9	7	36.96	51.00
Pinova	0	0	8	6	29.12	31.17
Redkroft	5	1	6	8	57.33	42.59
Free Redstar	0	0	1	4	12.00	32.25
Melfree	0	0	0	2	00.00	12.00
Gold Milenium	0	0	2	0	49.50	00.00

These cultivars also had the largest mean size of necrosis on branches. High sensivity of 'Topaz' to canker confirms the results obtained by Blażek (2004). The smallest number of trees infected by canker was found among cultivars 'Gold Milenium', 'Melfree' and 'Free Redstar', selected at the Research Institute of Pomology and Floriculture in Skierniewice (Tab. 1). If infected, these three cultivars and 'Bohemia' also had the smallest size of necrosis on trunks and branches. Susceptibility of scab-resistant apple cultivars 'Goldstar', 'Topaz', 'Pinova', 'Redkroft' and 'Rubinola' to apple canker must be taken into consideration when planting trees in orchards with organic fruit production.

Tree growth

After five years of growth, 'Rubinola', 'Gold Milenium' and 'Bohemia' proved to be the most vigorous cultivars. The weakest growing were 'Goldstar' and 'Redkroft' (Tab. 2). Growth vigor of these cultivars was similar to that reported earlier by Kruczyńska (2002) and Czynczyk et al. (2004; 2005). Growth vigor of cultivars tested in the two plots with different spraying programme was similar. One exception was 'Pinova', which in the treatment with limited spraying programme was significantly larger in comparison with unsprayed trees. Cultivars 'Bohemia', 'Rubinola' and 'Topaz' grown in unsprayed plot and mulched with agricultural spun-web formed significantly larger trees in comparison with trees grown in linen residue felt mulching (Tab. 3). Also the remaining cultivars mulched with linen residue felt grew slightly weaker in comparison with agricultural spun-web mulching.

Yielding

After five years of growth, nearly all cultivars grown in limited spraying programme had a tendency to bore higher yields in comparison with trees in unsprayed programme. The cultivars 'Gold Milenium', 'Pinova', 'Melrose' and 'Topaz' grown on the plot with limited spraying programme and in the soil mulched with agricultural spun-web, had the highest summarized yield and 'Goldstar' and 'Rubinola' the lowest (Tab. 2). These results are in agreement with earlier reports of Czynczyk et al. (2004; 2005), Kruczyńska (1999) and Kruczyńska et al. (1999). It shall be noticed that yields of scab-resistant cultivars obtained in this experiment are much lower than these obtained in the standard management programme (Sosna, 2003; Żurawicz et al., 2004; Lewandowski and Żurawicz, 2007).

Trees grown in the soil mulched with agricultural spun-web had a tendency to bore higher yield in comparison with trees grown in the soil mulched with linen residue felt and a sawdust. The cultivars 'Goldstar', 'Pinova' and 'Redkroft' grown in the soil mulched with linen residue felt bore the lowest yield. Remaining cultivars produced lower yield when grown in the soil mulched with linen residue felt and sawdust in comparison with yield

Table 2. Trunk cross-sectional area, yielding and mean fruit weight of nine scab-resistant apple cultivars grown in soil mulched with agricultural spun-web with two protection programmes

Cultivar	Chemical protection	Trunk cross-sectional area in 2006 [cm^2]	Yield [kg/tree]			Yielding efficiency [kg/cm^2 TCA]	Mean fruit weight [g]	
			2002-2003	2004-2006	2002-2006		2005	2006
Bohemia	none	16.18 a*	0.11 a	10.82 a	10.93 a	0.66 a	147 a	168 a
	limited	17.03 a	0.29 a	14.13 a	14.45 a	0.36 ha	162 a	164 a
Rubinola	none	17.94 a	1.70 a	9.55 a	11.25 a	0.65 a	119 a	165 a
	limited	19.20 a	0.96 a	9.91 a	11.04 a	0.66 a	120 a	157 a
Topaz	none	14.62 a	0.22 a	10.15 a	10.37 a	0.67 a	108 a	170 a
	limited	14.92 a	2.82 b	19.04 b	21.86 b	1.49 b	113 a	170 a
Goldstar	none	7.95 a	1.10 a	7.18 a	8.28 a	1.02 a	124 b	215 a
	limited	8.46 a	0.99 a	6.24 a	7.22 a	0.90 a	101 a	219 a
Pinova	none	11.31 a	4.46 a	9.51 a	13.98 a	1.21 a	111 a	105 a
	limited	14.00 b	4.90 a	19.93 b	24.83 b	1.79 b	100 a	120 a
Redkroft	none	9.82 a	3.57 a	7.10 a	10.66 a	1.10 a	123 a	177 b
	limited	11.07 a	3.26 a	15.12 b	18.44 b	1.71 b	112 a	128 a
Free Redstar	none	11.09 a	1.62 a	14.58 a	16.20 a	1.45 a	114 a	121 a
	limited	11.49 a	2.08 a	17.12 a	19.20 a	1.82 a	123 a	144 a
Melfree	none	10.16 a	3.66 a	9.72 a	13.38 a	1.32 a	111 a	99 a
	limited	11.39 a	4.87 b	16.52 b	21.39 b	1.92 b	110 a	127 a
Gold Milenium	none	18.88 a	2.33 b	14.00 a	16.33 a	0.88 a	126 a	111 a
	limited	16.41 a	1.24 a	26.79 b	28.03 b	1.73 b	121 a	108 a

*Averages followed by the same letter do not differ significantly at p = 0.05 (Duncan's multiple range test)

Table 3. Trunk cross-sectional area, yield and mean fruit weight of scab-resistant apple cultivars grown in two protection programmes under various mulching material

Cultivar	Chemical protection	Mulching material	Trunk cross-sectional area [cm^2]	Yield [kg/tree]			Yielding efficiency [kg/cm^2 TCA]	Mean fruit weight [g]	
				2002-2003	2004-2006	2002-2006		2005	2006
Bohemia	none	spun-web	16.18 b*	0.11 a	10.82 b	10.93 b	0.66 a	147 a	168 b
		linen-felt	12.13 a	0.42 b	7.19 ab	7.61 ab	0.58 a	152 a	132 ab
		sawdust	13.43 ab	0.47 b	5.01 a	5.48 a	0.41 a	157 a	110 a
	limited	spun-web	17.03 b	0.29 a	14.13 b	14.45 b	0.88 b	162 a	164 a
		linen-felt	12.07 a	0.25 a	9.04 ab	9.29 ab	0.78 ab	164 a	152 a
		sawdust	16.05 b	0.02 a	5.54 a	5.57 a	0.36 a	149 a	154 a
Rubinola	none	spun-web	17.94 b	1.70 b	9.55 b	11.25 b	0.65 b	119 a	165 a
		linen-felt	13.21 a	1.13 ab	5.09 a	6.22 a	0.23 a	114 a	129 a
		sawdust	15.26 ab	0.81 a	6.90 ab	7.71 a	0.50 b	119 a	148 a
	limited	spun-web	19.20 a	0.96 a	9.91 a	11.04 a	0.66 a	120 a	157 a
		linen- felt	14.28 a	0.85 a	9.38 a	10.13 a	0.72 a	124 a	146 a
		sawdust	16.48 a	0.63 a	9.37 a	10.10 a	0.62 a	124 a	175 a
Topaz	none	spun-web	14.62 b	0.22 a	10.15 a	10.37 a	0.67 a	108 a	170 a
		linen-felt	11.17 a	2.70 b	7.83 a	10.89 a	0.88 a	97 a	123 a
		sawdust	13.87 ab	1.71 b	11.55 a	13.26 a	0.95 a	109 a	166 a
	limited	spun-web	14.92 a	2.82 a	19.04 a	21.86 a	1.49 b	113 a	170 a
		linen-felt	14.98 a	2.05 a	13.30 a	15.35 a	1.05 a	109 a	185 a
		sawdust	14.60 a	2.62 a	14.22 a	16.84 a	1.13 a	102 a	168 a
Goldstar	none	spun-web	7.95 a	1.10 a	7.18 a	8.28 b	1.02 b	124 b	215 a
		linen-felt	6.55 a	0.72 a	4.27 a	4.99 a	0.76 ab	101 a	175 a
		sawdust	7.78 a	1.19 a	4.10 a	5.28 ab	0.69 a	121 b	232 a
	limited	spun-web	8.46 a	0.99 a	6.24 a	7.22 a	0.90 a	101 a	219 a
		linen-felt	7.67 a	0.99 a	4.74 a	5.72 a	0.75 a	116 a	119 a
		sawdust	9.94 a	1.25 a	6.96 a	8.21 a	0.81 a	128 a	243 a
Pinova	none	spun-web	11.31 a	4.46 b	9.51 a	13.98 b	1.21 b	111 a	105 a
		linen-felt	10.62 a	3.08 ab	5.74 a	8.82 a	0.84 a	99 a	119 a
		sawdust	11.95 a	1.59 a	7.32 ab	8.90 a	0.77 a	127 a	131 a
	limited	spun-web	14.00 a	4.90 a	19.93 a	24.83 a	1.79 a	100 a	120 a
		linen-felt	13.74 a	5.43 a	13.17 a	18.60 a	1.37 a	109 a	145 a
		sawdust	13.72 a	3.45 a	16.20 a	19.66 a	1.44 a	103 a	128 a
Redkroft	none	spun-web	9.82 a	3.57 a	7.10 a	10.66 a	1.10 a	123 a	177 b
		linen-felt	9.49 a	3.59 a	8.06 ab	11.61 a	1.24 a	119 a	147 ab
		sawdust	11.90 b	2.62 a	11.26 b	13.88 a	1.22 a	127 a	127 a
	limited	spun-web	11.07 a	3.26 a	15.12 a	18.44 a	1.71 b	112 a	128 a
		linen-felt	11.00 a	3.55 a	10.35 a	13.90 a	1.29 a	133 a	140 a
		sawdust	11.91 a	3.35 a	13.57 a	16.98 a	1.45 a	115 a	158 a

*Explanation, see Table 2

obtained from trees grown in agricultural spun-web. Leaves on these trees were pale green, showing easily visible nitrogen deficiency. Low yielding of the trees grown in the soil mulched with linen residue felt and a sawdust resulted probably from nitrogen deficiency in the mulching substrate. Microorganisms breaking up sawdust, linen residue felt and straw are absorbing much nitrogen from the soil (Mika et al., 1998). A higher productivity of apple trees grown in soil mulched with agricultural spun-web was also found by Mika et al. (1998) and Szewczuk and Gudarowska (2004). The yielding efficiency index, expressed in kg per 1 cm^2 of trunk cross-section area (TCA) had a tendency to be higher in the plots with limited spraying programme compared to unsprayed plot. The highest yielding efficiency index was achieved with cultivars 'Pinova', 'Redkroft' and 'Topaz' grown on the plots with limited spraying programme, where the soil was mulched with agricultural spun-web. In the plots with no spraying programme the highest cropping efficiency index showed 'Redkroft' and 'Pinova'.

The mean size and mean fruit weight of cultivars tested depended much on the climatic condition during the growing seasons. Much higher mean fruit weight was obtained in 2006 than in 2005 (see Tab. 2 and 3). In 2006, the largest were fruits of 'Goldstar', 'Topaz', 'Bohemia' and 'Rubinola'. Cultivars 'Bohemia' and 'Redkroft' grown on unsprayed plots and mulched with agricultural spun-web bore significantly larger fruit in comparison with trees mulched with a sawdust (see Tab. 3). The other cultivars bore smaller fruit. The size of fruit of all cultivars was too small to satisfy the needs of Polish consumers. Observed deficit of nitrogen had an enormous effect on the quality of fruit. This agrees with earlier reports by Kühn et al. (2003).

Apple scab was not observed during the 5-year trial. Powdery mildew was easily controlled by cutting back the infected shoots. Spraying with "Carpovirusine Super SC" limited the percentage of apples damaged by codling moths. Damage caused by spider mites did not create any economical problem. The greatest problem was aphid control. Cutting back shoots with first aphid infestation was the most promising method. During the five seasons of the experiment, cultivars 'Topaz', 'Bohemia', 'Rubinola', 'Redkroft' and 'Gold Milenium' appeared to be the most suitable for organic fruit production in modern orchards. 'Free Redstar' also is interesting for organic orchards. The cultivar 'Goldstar' bore large fruit but they were very susceptible to bitter pit. 'Pinova' and 'Melfree' grown on the light soil bore fruit that were too small to meet the consumers' expectations.

REFERENCES

Blażek J. 2004. Response to diseases in new apple cultivars from the Czech Republic. J. FRUIT ORNAM. PLANT RES. 12: 241-250.

Czynczyk A., Bielicki P., Mika A., Krawiec A. 2005. Growth and yielding of six scab resistant apple cultivars grafted on three dwarfing rootstocks in integrated fruit production. J. FRUIT ORNAM. PLANT RES. 13: 19-23.

Czynczyk A., Mika A., Bielicki P., Krawiec A. 2004. Evaluation of apple cultivars for sustainable fruit production. J. FRUIT ORNAM. PLANT RES. 12 (special ed.): 252-256.

Dayton D.F., Mowry J.B., Hough L., Bailey C., Williams E.B., Janick J., Emerson F.H. 1970. Prima, an early fall apple with resistance to apple scab. FRUIT VAR. HORTIC. DIG. 24: 20-22.

Decourtye L.M., Williams E.B., Janick J., Emerson F.H., Dayton D.F., Mowry J.B., Hough L.F., Bailey C. 1974. Priam apple. HORTSCIENCE 9: 401-402.

Kruczyńska D. 1999. Odmiany jabłoni do sadów z proekologiczną produkcją owoców. XXXVIII Ogólnopolski Zjazd Sadowników. Proekologiczna Produkcja Owoców, Skierniewice, 25-28 sierpnia 1999, pp. 12-17.

Kruczyńska D. 2002. Nowe odmiany jabłoni. HORTPRESS, Warszawa.

Kruczyńska D., Czynczyk A., Omiecińska B., Kołodziejek H. 1999. Ocena sadownicza jabłoni polskiej hodowli tolerancyjnych na parcha (*Venturia inaequalis* Che.). VIII Ogólnopolski Zjazd Naukowy "Hodowla Roślin Ogrodniczych u Progu XXI Wieku". Lublin, 4-5 lutego, pp. 405-408.

Kühn B.F., Andersen T.T., Pedersen H.L. 2003. Evaluation of 14 old unsprayed apple varieties. BIOL. AGR. HORT. 20: 301-310.

Lewandowski M., Żurawicz E. 2007. Plonowanie nowych parchoodpornych odmian jabłoni hodowli Instytutu Sadownictwa i Kwiaciarstwa w Skierniewicach na różnych typach podkładek. ROCZN. AKADEMII ROLNICZEJ W POZNANIU (in press).

Mika A., Krzewińska D., Olszewski T. 1998. Effects of mulches, herbicides and cultivation as orchard ground-cover management systems in young apple orchard. J. FRUIT ORNAM. PLANT RES. 6: 1-13.

Niemczyk E. 2000. Ten years of IFP in Poland – theory and practice. 5TH Int. Conf. on Integrated Fruit Production, October 22-26, 2000, Lleida (Spain), p. 15.

Sosna J. 2003. Growth and cropping of some scab resistant apple cultivars on four rootstocks. FOLIA HORT. ANN. 15/2: 125-129.

Szewczuk A., Gudarowska E. 2004. The effect of different types of mulching on yield, size, color and storability of 'Jonagored' apples. J. FRUIT ORNAM. PLANT. RES. 12: 207-214.

Williams E.B., Janick J., Emerson F.H., Dayton D.F., Mowry J.B., Hough L.F., Bailey C. 1972. Priscilla, a fall red apple with resistance to apple scab. FRUIT VAR. HORT. DIG. 26: 34-35.

Żurawicz E., Lewandowski M., Broniarek-Niemiec A., Rutkowski K. 2004. Preliminary results on the production value of new scab-resistant apple cultivars bred at the Research Institute of Pomology and Floriculture (RIPF), Skierniewice, Poland. ACTA HORT. 663: 879-882.

OCENA PRZYDATNOŚCI ODMIAN JABŁONI DO EKOLOGICZNEJ UPRAWY

Alojzy Czynczyk, Augustyn Mika, Paweł Bielicki i Adam Krawiec

S T R E S Z C Z E N I E

Dziewięć odmian jabłoni odpornych lub częściowo odpornych na parcha jabłoni: ‘Bohemia’, ‘Topaz’, ‘Rubinola’, ‘Goldstar’, ‘Pinova’, ‘Redkroft’, ‘Free Redstar’, ‘Melfree’ i ‘Gold Milenium’ szczepione na M.9 posadzono wiosną 2002 roku w SD w Dąbrowicach z przeznaczeniem do uprawy ekologicznej. Kwaterę podzielono na dwie części. W jednej części uprawiano jabłonie bez stosowania jakiejkolwiek ochrony chemicznej i herbicydów, w drugiej stosowano ograniczone zwalczanie szkodników i chorób środkami dopuszczonymi do ekologicznej produkcji owoców. Po posadzeniu drzewek glebę wzdłuż rzędów wyściółkowano agrowłókniną, wojłokiem z odpadów lnianych i trocinami. W międzyrzędziach glebę utrzymywano w murawie często koszonej. W ciągu 5 lat stwierdzono silne porażenie pni i konarów drzew przez raka drzew owocowych (z rodzaju *Nectria* sp.). Z tego powodu wypadło 18% drzew. Drzewa rosnące na glebie wyściółkowanej agrowłókniną rosły silniej i wydały większe plony w porównaniu z drzewami wyściółkowanymi kołnierzami wojłokowymi i trocinami. Największe plony zebrano z drzew odmian: ‘Gold Milenium’, ‘Pinova’, ‘Melfree’ i ‘Topaz’. Odmiany: ‘Topaz’, ‘Bohemia’, ‘Rubinola’, ‘Redkroft’ i ‘Gold Milenium’ są najbardziej przydatne do ekologicznej uprawy. Najtrudniejsze do zwalczania okazały się mszyce. Wczesne wycinanie młodych pędów porażonych przez mszyce wydaje się być dość obiecujące.

Słowa kluczowe: ekologiczna produkcja owoców, jabłka, odmiany parchoodporne, wrażliwość na raka drzew owocowych, wzrost drzew, owocowanie