American-Eurasian J. Agric. & Environ. Sci., 4 (2): 138-141, 2008
ISSN 1818-6769

Influences of Hand Thinning of Bud and Blossom on Crop Load, Fruit Characteristics and Fruit Growth Dynamic of *Újfehértói fürtös* Sour Cherry Cultivar

[1]*G.H. Davarynejad,* [2]*J. Nyéki,* [3]*T. Szabó and* [2]*Z. Szabó*

[1]Department of Horticulture, Ferdowsi University of Mashhad Iran
[2]University of Debrecen, Institute for Research and Development, Hungary
[3]Fruit Research and Extension Institute, Hungary

Abstract: Flower buds and flowers of Újfehértói fürtös sour cherry trees were hand thinned. The yield efficiency per unit of trunk cross- sectional area (TCSA), of 20% bud and 20% blossom thinned trees significantly increased compare with untreated control. The yield decreased with increasing the severity of thinning. Significant decreases were found between the yield efficiency per unit of TCSA, tree volume and surface area for the hand thinned treatment by 50% and 80% of buds and flowers in compare with untreated control treatment. Fruit weight and diameter increase linearly with increasing the severity of thinning. Fruits from trees thinned at 80% bud had significantly higher soluble solids compare with those thinned at 20% and 50% of buds and flowers and in compare with unthinned control trees. However, fruits from 80% bud thinned trees had significantly higher soluble solids than control and 50% bud and flower thinning.

Key words: Thinning · Sour cherry · Fruit quality · Growth dynamic

INTRODUCTION

Fruit thinning of large fruits is a critical cultural practice that affects availability of assimilates, fruit development, quality characteristics, yield and regulates tree yearly bearing. Crop load management by chemical or manual removal of blossoms or fruit has been shown to improve fruit quality in peach [1], wine grapes [2], apple [3], plum [4] and oranges [5]. Advantage of early thinning is that fruits ripen sooner [6]. However, too early thinning, i.e. blossom thinning reduces both fruit set and yield [7]. In contrast, potential yield is lost if thinning is undertaken after a source limited period begins [8] because fruits would be in competition with each other for assimilates. The reduction in fruit quality may be, at least partially, a consequence of a high ratio of fruit number to leaf area. High crop load reduced fruit quality and delayed maturity [9]. Generally, flower thinning is more effective in producing better quality of fruits compare with late fruit thinning [7].

Újfehértói fürtös sour cherry cultivar is the most extended cultivar in Hungary. According to Nyéki *et al*. [10], *Újfehértói fürtös* is a sour cherry cultivar that produces small fruit with low self-fertility (5%) and the fruit set by open pollination is about 24.5%.

Standard orchard management practices with highly productive rootstocks tend to result in high yields of small fruit [11-13].

Generally there are few available litterateurs that quantify the relationship between crop load, advantages of fruit thinning, fruit quantity and quality of sour cherry cultivars. The objective of this research was to investigate how sour cherry fruit size, fruit growth dynamic on tree, total yield and fruit quality are affected by bud and flower hand-thinning treatments.

MATERIALS AND METHODS

Plant Materials and Experimental Procedure: Twelve uniform vigor and canopy architecture trees of 10 years-old of *Újfehértói fürtös* sour cherry cultivar on *Prunus mahaleb* were selected. Trees are growing in a sandy soil at the experimental station of fruit Research and Extension Center for fruit growing, Újfehértó, located in the Eastern north part of Hungary. The mean annual temperature is 9.5°C and the annual rainfall over 50 years

Corresponding Author: Dr. G.H. Davarynejad, Department of Horticulture, Ferdowsi University of Mashhad, Iran

was 583 mm. The trees trained to a multiple-leader, open-center architecture and spaced 4.9 m in-row by 6.1 m between rows for a count of 340 trees per hectare were used in this study at the non irrigated orchard.

Four Treatments Were Studied: a non-thinned control and hand thinned by removing swollen fruit buds and opened flowers by 20, 50 and 80% throughout the whole of 12 similar tree canopies. The experimental design was completely randomized with 3 single tree / treatments. Each tree was treated as an experimental unit. Treatment means were compared using SAS software.

Weekly 100 randomly sampled fruit were evaluated for diameter of fruit growth dynamic on the trees and weekly 30 fruits per treatment were collected and immediately transported to the lab for, then mass fruit growth dynamic, length (mm), flesh and seed weight (g) and dry matter percentage were recorded. Trunk circumference was measured at 10 cm above the graft union at a similar interval and used to estimate trunk cross- sectional area (TCSA).

Fruit Quality Analysis: At commercial maturity, (2008.07.02.) fruits from each tree were harvested and weighted. Fruit quality and total harvested yield per tree were recorded at commercially harvest time, from each tree, after ripening time the above mentioned 100 random sampled fruits were evaluated for mass, flesh firmness, soluble solids, fruit Weight, diameter and fruit quality measurements.

The above mentioned 100 sampled fruits per tree were placed in labeled paper bags for further analysis. Fruit diameter was obtained by measuring the height, small and largest width using a digital caliper for all sampled fruits. Flesh firmness in kP/mm^2 was determined. Soluble solids concentration was determined on a freshly squeezed juice sample per fruit. The refractometer was cleaned with distilled deionized water between each reading.

Statistical Analysis: Data were statistically analyzed, as completely randomized design with 23 replicates (whole canopy of 3 tree) per treatment; Analysis of variance and Duncan's multiple range tests (α = 0.05) were done, using MSTATC program.

RESULTS AND DISCUSSION

Yield Efficiency, Fruit Weight and Diameter: The yield efficiency per unit of trunk cross- sectional area (TCSA), tree volume and surface area of *Újfehértói fürtös* sour cherry of 20% bud and 20% blossom hand thinned trees significantly increased compared with untreated control and other treatments (Table 1) while. Significant decreases were found between the yield efficiency per unit of TCSA, tree volume and surface area for untreated control treatment and the hand thinned treatment by 50% and 80% of bud and flowers.

Fruit from all treatment of thinned trees were significantly heavier than control. The fruits from 80% thinned trees were 31% heavier in compare with unthinned control (Fig. 1). There was no significant difference (P>0.05) in mean fruit weight and diameter between fruits from trees thinned at bud and flower stages (Fig. 1 and 2). The mean fruit size from 20% bud and blossom-thinned treatment trees was similar to that of 50% flower and significantly bigger than no-thinned control in exception of fruit from trees treated by 20% which was similar to control (Fig. 2).

Sour cherry fruit grow on the basis of fruit diameter is divided into three stages. A slow-growth stage till 4th and 5th weeks after fruit set (stage I) followed by a rapid increase between 5th and 6th weeks (stage II) and then by an accelerated growth period (stage III). Figure 4 and 5 show that growth speed of all treatments are the on stage 1 but on stage 2 the growth rate of thinned treatment was faster than unthinned control, also in the 3rd stage the 80% thinned bud and flower had the highest growth rate.

Table 1: The amount of fruits per cross-sectional area, tree volume and surface area

Treatments (% removed)	Trunk cross-sectional area (cm^2)	Tree volume (m^3)	The surface area (m^2) of tree	Yield efficiency g/ surface area (m^2)	Yield efficiency g/ Tree volume (m^3)	Yield efficiency g/ cm^2 TCSA
20% Bud	1017.30	29.64	12.78	1800	779	22.0a
50% Bud	1287.50	36.18	13.68	877	331	9.3c
80%- Bud	961.25	36.59	16.14	508	224	8.5d
20% flower	961.25	23.76	11.69	1967	968	23.9a
50% flower	1451.46	56.61	18.84	662	220	8.6d
80% flower	1256.00	27.25	13.35	749	363	7.9c
Control	1351.60	43.88	16.00	1168	462	13.8b

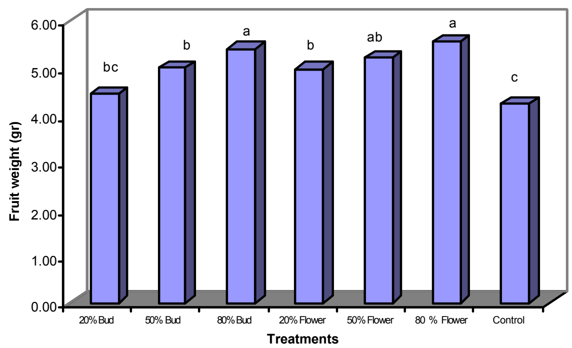

Fig.1: Effects of severity of buds and flowers thinning on mean fruit weight

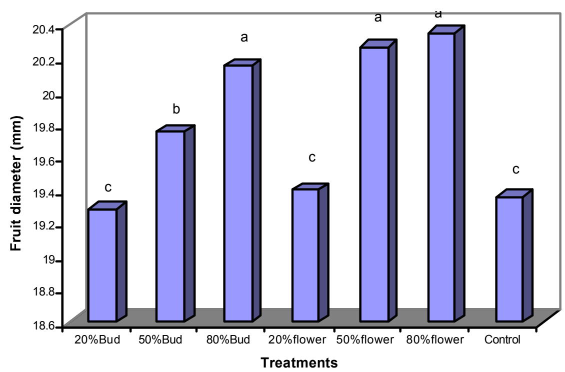

Fig. 2: Effects of severity of buds and flowers thinning on mean fruit diameter

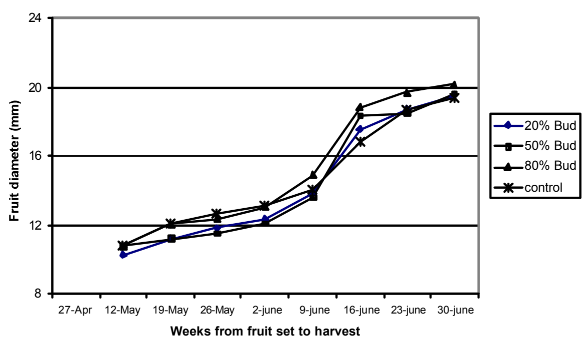

Fig. 3: Dynamic of fruit growth on the trees which was tinned at dormant bud stage

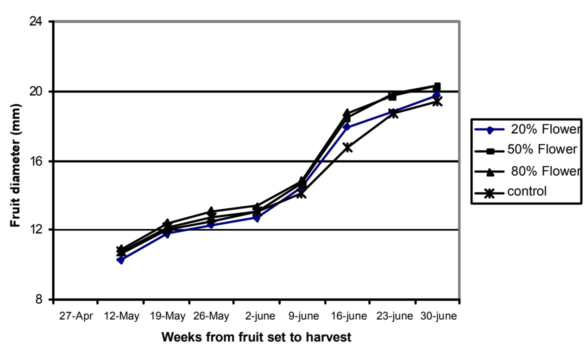

Fig. 4: Dynamic of fruit growth on the trees which was tinned at open flower stage

It seems that when a cherry tree's blossoms are thinned, less fruit is left on the tree so that the tree can devote more nutrients to develop each cherry into that the larger fruits.

Soluble Solids: Fruits from trees thinned at 80% bud had significantly higher soluble solids compared with those thinned at 20% and 50% of buds and flowers and in compare with unthinned control trees. However, fruits from 80% bud thinned trees had significantly higher soluble solids than control and 50% bud and flower thinning , but a higher concentration of soluble solids was not specific to kind of thinning (bud or flower) (Fig. 5).

Fruit Firmness: The effect of bud and blossom thinning on flesh firmness was not consistent. In both methods did not affect flesh firmness. The 80% thinning of both bud and flower thinning had less flesh firmness (Fig. 6). These results confirm the result obtained by Proebsting and Mills [9] which showed high crop load reduced fruit quality and delayed maturity.

CONCLUSION

All the treatments registered an increscent in weight as well as volume over the controls. The increscent in fruit size of treated fruit over controls was due to the reduction in the total crop. The reduction in fruit set and yield is a disadvantage if the increase in fruit size does not translate into increased market value. There are some new large fruit cultivars same as *Piramis* and *Érdi bõtermõ* which are good for fresh consumption. *Újfehértói fürtös* is suitable fruit for fresh consumption, but in some years the fruit size is not so desirable and fruit thinning can be profitable. The optimum percent of thinning was 20% of bud or flower thinning. There were no significant differences between dormant buds and flowers thinning. It is recommended to thin at bud stage, because it is easier.

However, in the basis of literature earlier tinning (bud) is more effective in producing better quality of fruits compared with later (flower) thinning, but our results don't show significant differences between bud and flower thinning. Hand thinning of whole canopy of sour cherry trees is not recommended because hand thinning is expensive as well as impracticable due to non-availability of labors.

REFERENCES

1. Farley, A.J., 1923. Factors that influence the effectiveness of peach thinning. Proc. Am. Soc. Hort. Sci., 20: 145-151.
2. Weaver, R.J. and R.M. Pool, 1971b. Chemical thinning of grape clusters (Vitis vinifera L.). Vitis, 10: 201-209.
3. Greene, D.W., W.R. Autio and P. Miller, 1990. Thinning activity of benzyladenine on several apple cultivars. J. Amer. Soc. Hort. Sci., 15(3): 1394-13400.
4. Wells, J.M. and M. Bukovac, 1978. Effect of fruit thinning on size and quality of "Stanley" plum (*Prunus domestica* L.). J. American Soc. Horticul. Sci., 103: 612-616.
5. Hutton, R.J., 1992. Improving fruit size and packout of late Valencia oranges with ethephon fruit-thinning sprays. Austral. J. Expt. Agr., 32(6): 753-758 .
6. Havis, A.L., 1962. Effects of time of fruit thinning of Red haven peach. Proc. Amer. Soc. Hort. Sci., 80: 172-176.
7. Whiting, M.D. and G.A. Lang, 2004. 'Bing' sweet cherry on the-- dwarfing rootstock Gisela 5: thinning affects fruit quality and vegetative growth, but not net CO_2 assimilation. J. Amer. Soc. Hort. Sci., 129: 407-415.
8. Grossman, Y .L. and T.M. DeJong, 1994. Peagh: A simulation model of reproductive and vegetative growth in peach trees. Tree Physiol., 14(4): 329-345.
9. Proebsting, E.L. and H.H. Mills, 1981. Effects of season and crop load on maturity charactristics of Bing cherry. J. Amer. Soc. Hort. Sci., 106: 144-146.
10. Nyéki, J., M. Soltész and T. Szabó, 2008. Establishment and production techniques of sour cherry orchards, pub. Univ. Debrecen Hungary, pp: 100, ISBN 978 963 9732 37 7.
11. Edin , M., A. Garcin, J. Lichou and J.M. Jourdain, 1996. Influence of dwarfing cherry rootstocks on fruit production. Acta Hort., 410.
12. Lang, G.A., 2000. Precocious, dwarfing and productive - how will new cherry rootstocks impact the sweet cherry industry? Hort. Technol., 10: 719-725.
13. Lang, G.A. and D.R. Ophardt, 2000. Intensive crop regulation strategies in sweet cherries. Acta Horticult., 514: 227-234.