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SHORT COMMUNICATION

Relationship between Anthesis and Harvest Date in Highbush Blueberry

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Summary

The relationship between anthesis, harvest time, and fruit quality using 840 flowers of 'Jersey' highbush blueberry was investigated. The time of flowering and berry harvest was significantly correlated (**r**=0.485) at the 1% level. Thus, flowers which bloom early produced early maturing berries. The highest coefficient of correlation existed between harvest date and the number of days to maturity (**r**=0.718), whereas that between harvest date and berry weight was negatively but highly correlated (**r**=-0.660). Considering this bloom characteristic, the possibility exists that harvest date can be manipulated by controlling flowering time through the application of a plant growth regulator, adjusting the cluster size, and/or the degree of pollination and seed set.

Key Words: berry growth, flowering date, harvesting date, highbush blueberry.

Introduction

Individual blueberry ripens in a flower cluster at different times so that a grower must harvest each ripe berry by hand. The ripening period of a berry is highly correlated with the number of seeds (Darrow,1958; Tamada and Kihara, 1991), the berry size (Eck and Childers,1966;Tamada and Iwagaki,1977) and the growing days (Suzuki et al., 1998). Gough (1994) reported that the time of ripening does not correlate directly with the time of flowering but Suzuki et al. (1998) found otherwise with potted 'Jersey' plants grown in a greenhouse. They attributed the difference in the planting conditions between pots in an enclosure and the open field. Thus, we used adult bushes grown in the field to investigate the possible relationship between the flowering and maturation period.

Materials and Methods

The experiment was carried out in 1998 with three, 20-yr-old highbush blueberry bushes (*Vaccinium corymbosum* L.) cv. Jersey, growing in the Iwate University field. Five moderately vigorous, bearing branches were selected from each bush. Their length, number of flower buds, flowers per cluster, and their position in a cluster were recorded. The number of leaves was estimated by the number of leaf buds and shoot length. Pollination was done by honey bees set in the planting in late April; anthesis of individual flower buds was observed almost daily from 30 April to 2 June. Berry set was computed in mid-June after all petals had fallen. Blue, ripe fruits (ripe stage), as classified by Shutak et al. (1980, cited by Gough, 1994) were picked individually by hand between 4 July and 10 August at intervals of 2 to 3 days, counted, and weighed. Harvested berries were frozen at -30 ℃. After the harvest was finished, each frozen berry was thawed and analyzed for soluble solid.

No chemical agents were used to kill insects or prevent diseases, however, the bushes were covered with a netting to protect them from birds.

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Results and Discussion

Shoot length, the number of flower buds, and the flowering date (Table 1) reveal that there were 841 flowers on 14 branches (one branch died during the experiment). The first flower opened on 1 May; the last on 30 May and the average was 13 May. Full bloom (70% open flowers) occurred 16 May (Fig. 1A). The average full bloom date from 1978 to 1988 in 'Jersey' in this field is 27 May (Yokota, 1989). Thus this year it was ten days early. Percent fruit set in mid-June was 96%, indicating that the pollination by bees was normal. A total of 475 berries, or 56.5% of the initial flowers, were harvested. The reduction in the final set is attributed to insects, disease and natural preharvest abscission.

The berries were picked from 4 July to 30 July; maximum harvest fell on 24 July, whereas the average date was 22 July (Fig. 1B). Since the average date of maximum harvest was 1 Aug. (Yokota, 1989), this date was one week early in 1998.

The correlation coefficient between harvest date and the duration of growth was the highest (**r**=0.718), followed by a high negative correlation between growth duration and berry weight (**r**=-0.660)(Table 2). Thus, the faster growing berries were larger and ripened earlier. This result agreed with the previous reports (Eck and Childers, 1966; Tamada and Iwagaki,1977).

The relation between the flowering date and harvest date, the main objective of this experiment, correlated significantly with **r**=0.485 at the 1% level (Fig. 2),

Table 1. Characteristics of fruit bearing shoots used in experiment and berries harvested.

	No. of shoot observed	Shoot length (cm)	No. of flower buds	No. of flowers	No. of flowers per bud	No. of fruit set at Mid.-June	Rate of berries set (%)	No. of berries harvested	No. of berries harvested per bud	Rate of berries harvested (%)
Total	14		87.0	841.0		806.0		475.0		
Average		32.3	6.2	60.1	10.0	57.6	96.0	33.9	5.6	56.7
SD		8.1	2.4	20.0	2.5	19.0	4.0	15.6	1.9	14.7

	Flowering date	Full harvesting date	Period of growth (Days)	Berry weight (g)	Soluble solid (Brix)	Number of leaves per shoot	Leaf/berry ratio
Average	13-May	22-Jul	70.0	1.16	12.7	98.2	3.6
SD	3.3	3.9	3.0	0.2	0.7	34.3	2.1

Table 2. Coefficient of correlation between several characteristics of flowering and growth (n = 475)

	Position[z]	Flowering date	Harvesting date	Period of growth	Berry weight	Soluble solid
Position	1.000					
Flowering date	−0.246**[y]	1.000				
Harvesting date	−0.104*	0.485**	1.000			
Period of growth	0.081	−0.260**	0.718**	1.000		
Berry weight	−0.035	0.029	−0.576**	−0.660**	1.000	
Soluble solid	−0.023	−0.018	−0.031	−0.020	−0.032	1.000

[z] Number was counted from the apical to proximal site in a cluster.

[y] *, ** Significant at $P = 0.05, 0.01$ level, individually.

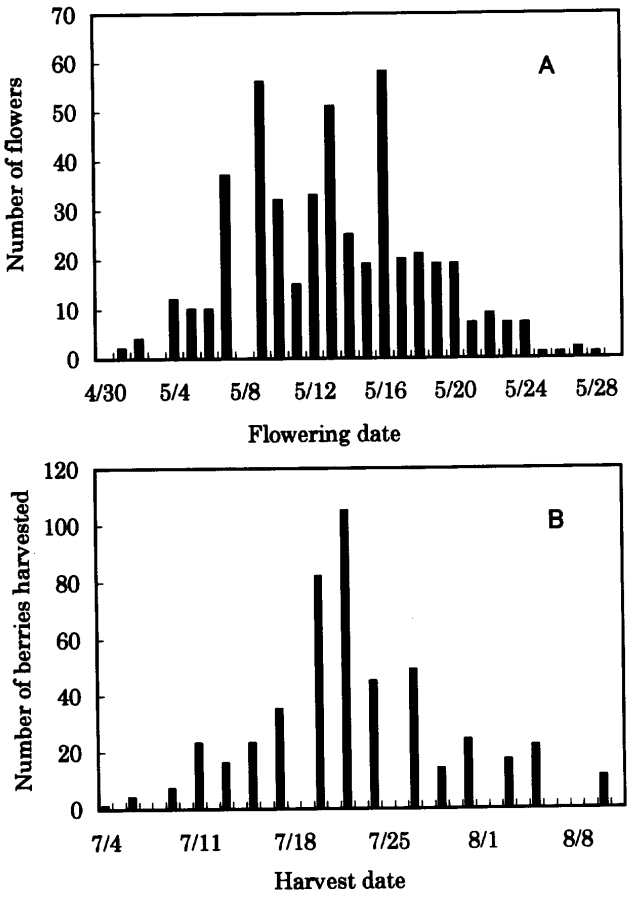

Fig. 1. Distribution of flowering date and harvest date in flowers and berries. A: flowering date; B: harvest date.

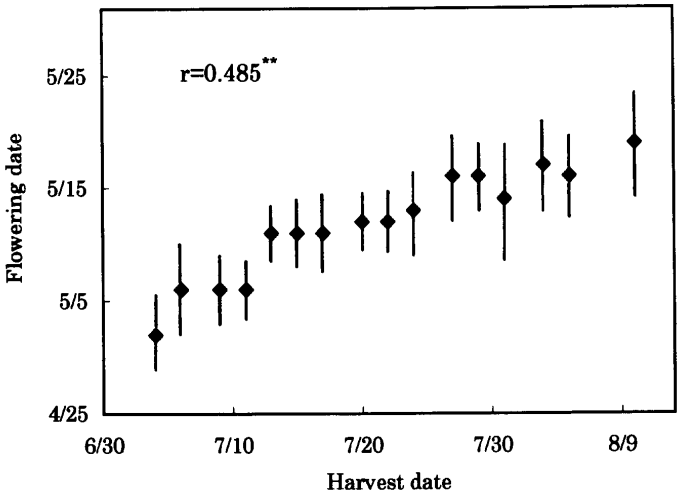

Fig. 2. Relationship between harvest date and flowering date of individual berries. Vertical bar shows SD.

indicating that the earlier the flower opened, the earlier its fruit ripened.

No significant correlations were found between the soluble solids content and the other parameters. The absence of a correlation is attributed to the leaf/berry ratio of 3.6 (Table 1), which indicates that there were sufficient photosynthates to produce berries that meet the minimum marketing quality.

The significant relation between the flowering date and harvest date indicates that harvest time could be manipulated by controlling anthesis with the application

of plant growth regulator, adjusting the crop load, and/or assuring adequate pollination for seed set.

Literature Cited

Darrow, G. M. 1958. Seed number in blueberry fruits. Proc. Amer. Soc. Hort. Sci. 72: 212-215.

Eck, P. and N. F. Childers. 1966. Blueberry culture. p.179-188. Rutgers Univ. Press. New Brunswick and New Jersey.

Gough, R. E. 1994. The highbush blueberry and its management. p.51-55. Food Products Press, New York.

Shutak, V. G., R. E. Gough and N. D. Windus. 1980. The cultivated highbush blueberry; twenty years of research. Rhode Island Agricultural Experiment Station Bulliten. 428.

Suzuki, A., T. Shimizu and K. Aoba. 1998. Effects of leaf/fruit ratio and pollen density on highbush blueberry fruit quality and maturation. J. Japan. Soc. Hort. Sci. 67: 739-743 (In Japanese with English summary).

Tamada, T. and H. Iwagaki. 1977. The pollination of rabbiteye blueberry in Tokyo. Acta Hortic. 61: 335-341.

Tamada, T. and M. Kihara. 1991. Effects of pollen parent on the fruit set, berry weight and number of seed per berry in highbush and rabbiteye blueberries. Bull. Chiba Agric. College 5: 17-27 (In Japanese with English summary).

Yokota, K. 1989. Characteristics and selections of advantageous blueberry cultivars in Iwate. J. Fac. Agric. Iwate Univ. 19:149-159 (In Japanese with English summary).

ハイブッシュブルーベリーの開花日と成熟日の関係

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摘　要

ハイブッシュブルーベリーにおける開花時期と成熟時期の関係を検討するため，成木の'Jersey'を供試して，約840花の開花日と成熟日および果実品質を調査した．その結果，開花日と収穫日の関係は1%水準(r=0.485)で有意差が認められ，開花の早い花ほど収穫日が早いことが明らかとなった．調査項目の中で最も相関の高かった関係は，収穫日と成熟日数の関係で，次いでそれらと果粒重の関係であった．この開花特性から，花房の整形，植物生長調節剤の利用等により開花時期を制御することで，収穫時期を制御できる可能性が示唆された．