11. Pham-hoang, Ho. 1991. Cay Co Vietnam. Quyen I: Tap 1va 2. An illustrated flora of Vietnam. Mekong Printing. Santa Ana, CA.
12. Pham-hoang, Ho. 1992. Cay Co Vietnam. Quyen II. Tap 1. An illustrated flora of Vietnam. Mekong Printing. Santa Ana, CA.
13. Pham-hoang, Ho. 1993. Cay Co Vietnam. Quyen II: Tap 2, Quyen III: Tap 1 va 2. An illustrated flora of Vietnam. Mekong Printing. Santa Ana, CA.
14. Pham-ngoc Lieu and Pham-van, Vui. 1995. Nhung Giong Cay an Trai Duoc Ua Chuong. So Thang Hai: trang 8. Phu Truong Nguoi Lam Vuon. Thanh Pho Can Tho. Vietnam.
15. Sauco, V. G. and U. G. Menini. 1989. Litchi Cultivation. FAO Plant Production and Protection Paper 83. Food and Agriculture Organization of the United Nations, Rome.
16. Simoons, F. J. 1991. Food in China. A cultural and historical inquiry. CRC Press. Boca Raton.
17. Tankard, Glenn. 1987. Tropical fruit. An Australian guide to growing and using exotic fruits. Viking O'Neil, Penguin Books Australia Ltd.
18. Tindall, H. D.; U. G. Menini U. G. and A. J. Holder. 1994. Rambutan cultivation. FAO Plant Production and Protection Paper 121. Food and Agriculture Organization of the United Nations, Rome.
19. Ton-that, Trinh. 1995. Tim Hieu Ve Cac Loai Cay an Trai Co Trien Vong Xuat Khau. Nha Xuat Ban Nong Nghiep. Vien Khoa Hoc Nong Nghiep Mien Nam. Thanh Pho Ho Chi Minh. Vietnam
20. Tran-dinh, Long. 1996. The strategies for PGR conservation and utilization in Vietnam, p. 54-59. In: Plant genetic resources in Vietnam. Proc. Nat. Workshop Strengthening Plant Genet. Res. Programme in Vietnam. Agriculture Publishing House. Hanoi, Vietnam.
21. Tran-the, Tuc. 1996. Fruit crops genetic resources in Vietnam, pp. 130-131. In: Plant genetic resources in Vietnam. Proc. Nat. Workshop Strengthening Plant Genet. Res. Prog. in Vietnam. Agriculture Publishing House. Hanoi, Vietnam.
22. Vien Kinh Te Sinh Thai. 1994. Tai Nguyen Rung Vietnam. Chu bien. GS. TS. Nguyen Van Truong. Nha Xuat Ban Nong Nghiep. Hanoi, Vietnam.
23. Vu-tuyen, Hoang. 1996. Conservation and Diversification of PGR in Vietnam, pp. 112-113. In: Plant genetic resources in Vietnam. Proc. Nat. Workshop Strengthening Plant Genet. Res. Prog. in Vietnam. Agriculture Publishing House. Hanoi, Vietnam.
24. Vu-tuyen, Hoang. 1995. Ve Loai & Giong Cay An Trai O Vietnam. pp. 6 and 32. Phu Truong Nguoi Lam Vuon. So Thang Hai.Thanh Pho Can Tho. Vietnam.

Fruit Varieties Journal 53(3):181-183 1999

Sweet Cherry and Adaptation to Mild Winters

J. J. MARTÍNEZ,[1] A. A. GARDEA[1] S. SAGNELLI,[2] AND J. OLIVAS[3]

Abstract

The response to marginal winter chilling accumulation of six sweet cherry cultivars was evaluated as well as the use of hydrogen-cyanamide as a dormancy braking agent to regularize the bud opening and its impact on fruitfulness and quality. Bud sticks were collected at a cherry orchard located in Northwest Mexico, treated with cyanamide at 1, 2.5 and 3.5 % and forced to sprout. Based on the results, a dose of 2.5% of cyanamide was selected to treat groups of trees on two dates and with single and double treatments; cvs. Bing, Van and Stella showed a positive response to mild winters and dormancy breaking procedure being reflected on yield and good quality. 'Hedelfingen' and 'Emperor Francis' cultivars seems to be moderately affected by winter chilling reduction and 'Sam' cultivar had a very poor adaptability to such conditions and did not respond to cyanamide treatments.

[1]Centro de Investigación en Alimentación y Desarrollo, A.C. Unidad Cuauhtémoc, A.P. 781, 31570 Cuauhtémoc, Chih. México.
[2]Universidad de Sonora, A.P. 305, 83000 Hermosillo, Son. México.
[3]S.P.R. de R.I. Mazacahui, Yécora, Son. México.

Introduction

The Sweet cherry culture is not common in Mexico, it has been grown on areas of high winter chilling and a high incidence of spring frosts, which define low yields and marginal profits.

The culture of this crop in areas of mild winters, reduces the incidence of spring frosts, but results in erratic blooming and delayed foliation on unadapted cultivars due to a low accumulation of winter chilling (3).

However when these problems are solved, advantages such as early harvest and high crop value on domestic and export markets are achieved.

The performance of grapes, peaches, apples and plums are well known in such conditions. However little research has been published in Bing and Van sweet cherries.

Several areas in the world face conditions of mild winters, like Spain, Mexico and Chile where it is a common practice the use of cyanamide as dormancy breaking agent, producing good results on sweet cherries, on cultivars like Bing and Van (1).

Two strategies are now being used to produce sweet cherries in areas of limited chilling without quality reduction, use of adapted cultivars and management practices like defoliation, pruning and treatments with dormancy braking agents such as hydrogen or calcium cyanamide (1) or garlic oil (2).

The use of dormancy breaking agents is also useful on improving overlap of flowering to enhance pollination among cultivars (4)

In order to evaluate the adaptability to mild winters, six cultivars of sweet cherry, in two different experiments, have been evaluated, considering the use of hydrogen cyanamide as dormancy breaking agent, and the natural adaptation of cultivars to the region climate.

Methods

The experiments were carried out at Yecora, in Sonora, Mexico, at an elevation of 1800m above sea level, considered as a zone of moderate winter, where chilling varies from 500 to 700 units. The site has a topography of mountains and a vegetation of transition, predominating oaks, pine trees and spiny shrubs.

To evaluate their adaptability to this zone of mild winters, Bing, Van, Stella, Emperor Francis, Sam and Hedelfingen cvs. were used.

Experiment 1.

The use of hydrogen cyanamide has been evaluated on excised budwood placed on controlled conditions two months earlier than the expected bloom date.

Twenty bud sticks by treatment for each cultivar were collected, their length was 30cm with their terminal bud intact when 500 chill units were attained. The plant material was transported to the laboratory and the bases were re-cut under water and placed in plain water; after treatment of 1.0, 2.5 3.5% of a hydrogen cyanamide solution and a control, the material was placed on a growth chamber with a temperature of 25°C, 60% relative humidity and continuous light of 49 $\mu e.m^{-2} . sec^{-1}$.

The experiment had a split plot design with 20 replications. The variable recorded was percentage bud opening. The analysis of variance and a Duncan's mean separation test were used.

Experiment 2.

According to the pervious experiment, thirty trees of each variety were treated with 2.5% (a.i.) hydrogen cyanamide as follows: ten trees on February 19, ten trees on March 4, and 10 trees were double treated on Feb. 19 and March 4; ten additional trees were used as non treated control.

The percent of bud opening was recorded 55 days after the first application.

The chilling accumulation at the time of the first treatment was 600 chill units.

Table 1. Effect of hydrogen cyanamide on bud opening (%) on sweet cherries.

Cultivar	Control	Concentration 3.5	2.5	1.0
Bing	25.0 ef*	62.7 d	74.0 c	73.0 c
Stella	37.0 e	82.5 b	83.5 b	86.5 ab
Van	27.7 e	68.2 cd	84.7 b	92.0 a
Emperor	29.7 e	86.7 ab	79.0 bc	89.0 a
Hedelfingen	24.5 ef	63.7 d	89.2 a	68.7 cd

*Means within columns separated by different letters are significant differences at 5% (Duncan test)

Results

Experiment 1.

Bud opening after 30 days from treatment date, recorded on the control on all cultivars was less than any of the treatments. Best response was obtained with 'Van' at 1.0% a.i. of cyanamide, followed by 'Emperor' and 'Stella' at the same concentration. 'Bing' and 'Hedelfingen' had a better response at 2.5%. (Table 1). In general, the results were better at the lower concentration. Therefore the lower concentration was sprayed on trees on experiment 2.

Experiment 2.

Bud opening 53 days after the first treatment was affected by cyanamide. Untreated trees showed lesser response on all cvs.

Early application (February 19) and double treatment (February 19 and March 4) had a higher response than late treatment alone (March 4).

The statistical analysis shows almost no difference between dates of treatment, however, concerning the cultivars evaluated, Van and Bing were the most adapted. Sam and Emperor showed a poor response and need higher chilling accumulation. (Table 2).

Table 2. Bud opening at 53 days after first cyanamide treatment.

Cultivar	March 4	February 19	Double treat	Control
Van	88 ab	95 a	99 a	50 e
Bing	85 b	90 ab	96 a	48 e
Sam	39 fg	56 d	55 d	27 h
Emperor	43 ef	56 d	65 c	31 g

Discussion.

Bing, Stella, Hedelfingen, and Van seem to be best adapted to our region. Sam and Emperor Francis are not considered as suitable for cultivation, even with the use of dormancy breaking agents.

Fruit quality obtained is acceptable for any market, however, scarce historical data are insufficient to determine profitability.

The use of hydrogen cyanamide proved to be an efficient aid to improve bud burst and bloom. It is important to determine the time and rate of cyanamide to be used, but the information must be generated for each individual cultivar and it could be important to test material at different times during the winter.

A more detailed study must be conducted to obtain a better understanding of dormancy on sweet cherries.

Literature Cited

1. Gil-Salaya, G., 1998. El Potencial Productivo, Chapter 4, Letargo de Yemas, Guindo. 99-102. Edited by Pontificia Universidad Católica de Chile.
2. Kataoka, I., Sugiyasu, K., 1994. Enhancing bud break in peach and sweet cherry by garlic treatments. Technical Bull. Of the Fac. of Agriculture, Kagawa University, Japan. Vol. 2, 93-110.
3. Lichou, J., Edin, M., Tronel, C., Saunier, R., 1990. Le Cerisier, "La Cerise de Table," Chapter 3, L'Espece, pp. 40. Editions CTIFL, France.
4. Lupo, A., Eisikowitch, D., 1994. Pollination of sweet cherries (*Prunus avium* L.) in Israel. Alon-Hanotea 48:12, 522-528.

Root Zone Temp and Apple N Absorption

Low temp (8°C) reduced rate of N uptake compared to high temp (23°C). Uptake rates were similar 2, 4 and 8 days after N application and total amount of N was not influenced by root zone temp. From Toselli et al. 1999. J. Hort. Sci. and Biotech 74(1)118-124.