Effect of gibberellins and 2,4,5-T inducing fruit setting in sour cherry orchards

Wpływ gibereliny i 2,4,5-T na zawiązywanie się owoców w sadach wiśniowych

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It is generally believed that in one-seeded stone fruits it is much more difficult to induce parthenocarp by means of chemical stimuli than in many-seeded pomaceous fruits (Luckwill 1959).

The recently reported works of Crane (1960, 1961, Luckwill 1959) conducted in California, indicated that it is possible to induce parthenocarp in drupes by means of GA or GA together with other chemical stimuli. These results are very interesting and important from the theoretical point of view, they do not, however, have any notable economical significance.

The studies conducted during the years 1961—1963 in the Department of Pomology, College of Agriculture, in Poznań have provided confirmation of Crane's et al. results as regards plums (Fig. 1), and besides, some very interesting results of economic importance (Fig. 2) with cherries.

In these studies Wierszyźłowski, Rebandel and Babilas (1962, 1963 and unpublished) attempted to prevent the excessive abscission (almost 100%) of fruitlets in the plum 'Bühlerthal Zwetsche' and in the sour cherry 'Spanische Schwarze' (Fig. 1 and 2, control) by means of natural stimuli such as: a pollen mixture of 4 plums varieties (Fig. 1) and of chemical stimuli: 2,4,5-T* and Gibrescol** used singly or jointly at the end of flowering (Fig. 1 and 2). The results presented in Fig. 1 indicate that the plum fruitlet abscission in the early period was prevented more effectively by chemical stimuli (2,4,5-T, 2,4,5-T +

* Used in the form of butyl ester of 2,4,5-T, 60% emulsified concentrate produced by Institute of Organic Chemistry.

** A mixture of gibberellic acids A₁, A₂ and A₃, the amount of the chief component A₃ being 90—94 per cent.

Fig. 1. Effect of treatments on fruit-setting of the plum var. 'Bühlerthal Zwetsche'

1 — control; 2 — single spray with 2,4,5-T (30 ppm) at the end of flowering; 3 — single spray with Gibrescol (250 ppm) at the end of flowering; 4 — flowers fertilized with a pollen mixture of 4 varieties; 5 — single spray with a mixture of 2,4,5-T (30 ppm) and Gibrescol (250 ppm) at the end of flowering

Fig. 2. Effect of treatments on fruit-setting of the sour cherry 'Spanische Schwarze'

1 — control, ripening after 96 days; 2 — single spray with 2,4,5-T (30 ppm) at the end flowering; ripening after 77 days; 3 — single spray with 2,4,5-T (30 ppm) at the end of flowering and 3 sprays with Gibrescol (500 ppm) at 2 weekly intervals, ripening after 109 days; 4 — two sprays with Gibrescol (500 ppm) and one spray with 2,4,5-T (30 ppm) + 4 spray with Gibrescol (500 ppm); (first spray at the end of flowering, following sprays at weekly intervals). Ripening after 121 days

Gibrescol, or Gibrescol) than by natural ones (pollinia of 4 varieties). A few weeks after full bloom the situation changed and in the final result only the 2,4,5-T + Gibrescol mixture was as effective as the natural stimuli. Although preventing fruitlet abscission, the value of the chemical stimuli in the case of spraying with 2,4,5-T was doubtful, because the parthenocarpic fruits were elongated, small, deformed and unsuitable for consumption. Under the influence of the mixture of both substances the fruits were a little smaller than control ones. Only the slight variations of the shape of fruits were observed. Under the influence of Gibrescol the branches developed many thorns, an effect already known from Crane's et al. results (1960).

Table 1

Mean yields (kg per tree) of sour cherries var. 'Spanische Schwarze' in the farm orchard Szreniawa near Poznań

Treatments	Yield kg per tree
1. Control	5,1
2. Single spray with a mixture of Gibrescol — 500 ppm + 2,4,5-T, 30 ppm, at the end of flowering	18,5*
3. Single spray with a mixture of Gibrescol — 250 ppm + 2,4,5-T, 30 ppm, at the end of flowering	19,4*
4. Two sprays with a mixture of Gibrescol — 250 ppm + 2,4,5-T, 30 ppm, at the end of flowering and 2 weeks later	32,0*
5. First spray with Gibrescol — 500 ppm (at the end of flowering), second spray with 2,4,5-T, 30 ppm (two weeks later)	21,8*
6. Single spray with 2,4,5-T — 30 ppm, at the end of flowering	9,7
LSD at 5% level	7,9
LSD at 1% level	11,0

* Significant difference at 1% level.

The same chemicals applied to cherry in the treatments shown in Fig. 2 and Table 1 gave very good results in the form of prevention of fruitlet abscission (Fig. 3). The fruits obtained in this way were parthenocarpic (Fig. 4), smaller and some times one half the weight of normal

Fig. 3. Effect of treatments with a mixture of Gibrescol (250 ppm) and 2,4,5-T (30 ppm) on fruit setting of sour cherry 'Spanische Schwarze' left — treated; right — control

ones, presumably as a result of the absence of seeds and competition for nutrients. These depended to some extent on the chemical used. After Gibrescol the fruits were larger and more like the controls than after 2,4,5-T.

Most surprising was the variation in the fruit ripening-time under the influence of chemical stimuli. Flowers sprayed once only with 2,4,5-T at 30 ppm, gave in 1962 ripe fruits 3 weeks earlier than the controls.

After 3 to 6 sprays with Gibrescol ripening occurred at various times even as much as 4 weeks later than the control. Such artificial ex-

Fig. 4. Pits and seeds of sour cherry 'Spanische Schwarze'

Right, upper — pits of control-seeded fruits. Right, lower — seeds and endocarps of the control fruits. Left, upper — pits of the parthenocarpic fruits after the treatments with a mixture of Gibrescol 250 ppm and 2,4,5-T — 30 ppm at the end of flowering. Left, lower — endocarps of the parthenocarpic fruits

tension of the ripening time in the same variety of fruits may be very interesting since it brings us closer to the ideal observable in citrus fruits which fructify continuously for several months, though of course in different climatic conditions.

In general we can state that the butyl ester 2,4,5-T and Gibrescol — both of Polish production — are good chemical stimuli for the induction of fruit setting in the cherry *Spanische Schwarze*, because:

- 1) they give a large percentage of ripe, well formed fruits;
- 2) they result in a significant increase of the yield from 5 to 30 kg per tree (Table 1);
- 3) they are not toxic to the tree;
- 4) in several sprays they have no negative effect on the recurrent annual fruiting of the cherries.

STRESZCZENIE

W Katedrze Sadownictwa WSR w Poznaniu od r. 1960 prowadzi się badania nad powstrzymywaniem nadmiernego opadania kwiatów i zawiązków u śliw i wiśni.

U śliwy 'Węgierka z Bühl' najlepszym sposobem powstrzymywania opadu zawiązków było sztuczne zapylenie kwiatów mieszaniną pyłku 4 odmian: 'Tragedy', 'Węgierka Włoska', 'Renkloda Althana' i 'Wiktoria' (ryc. 1).

U wiśni 'Hiszpanka Czarna Późna' opad zawiązków najlepiej wstrzymywały opryskiwania pod koniec kwitnienia Gibrescolem i Krzewotoksem polskiej produkcji. Jednorazowe opryskiwanie estrem butylowym 2,4,5-T (Krzewotoks) w stęż. 30 ppm przyspieszało, podczas gdy kilkakrotne powtarzanie oprysku Gibrescolem w stęż. 250 i 500 ppm (ryc. 2) opóźniało dojrzewanie owoców. Najlepsze rezultaty na skalę produkcyjną wyrażające się istotną wyższą plonem z 5 na 30 kg z drzewa uzyskano w PGR-Szreniawa przy opryskiwaniach mieszaniną 2,4,5-T o stężeniu 30 ppm z Gibrescolem o stężeniu 250 lub 500 ppm, zastosowanych jednorazowo lub dwukrotnie. Pierwsze opryskiwanie stosowano przy końcu kwitnienia, ewentualne drugie powtarzano dwa tygodnie później (ryc. 3, tab. 1).

Owoce uzyskane pod wpływem opryskiwania były partenokarpiczne i mniejsze aniżeli u drzew kontrolnych. Brak nasion wpływał nie tylko na zmniejszenie owoców, ale powodował również wyraźne zmniejszenie wielkości i ciężaru pestki (ryc. 4).

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