

Observations on the Parthenocarpic Response of Blueberry to Gibberellic Acid

It was previously noted^{1,2} that the lowbush blueberry, *Vaccinium angustifolium* Ait., will respond to gibberellic acid (GA) placed on the open flower, by the formation of parthenocarpic fruit. It has not been possible to effect the same response in the field on any broad scale. The reasons for this are not understood, but some evidence has been obtained to suggest that certain clones are more receptive to GA than others. The period of receptivity to the growth substance is also well defined and the parthenocarpic fruits seem to swell up more slowly than do seeded berries.

Because in a practical field operation there is no possibility of excluding pollinating insects, only a limited experiment could be established to determine whether application of GA curtails normal fertilization or whether the opposite effect occurs.

Vegetative cuttings in the greenhouse were induced to flower by subjecting them to a regimen of 8 h of light per day³. When flowering became general in eleven clones, freshly opened flowers were selected, unopened buds and older flowers were excised, and one of the following treatments was administered: (1) treatment with water (controls); (2) hand pollination; (3) treatment with GA in water (50 p.p.m.); (4) sprayed with 50 p.p.m. GA, and 24 and 48 h later hand pollinated; (5) hand pollinated and 24 and 48 h later sprayed with GA at 50 p.p.m.

Table 1. RELATIONSHIP BETWEEN SEED CONTENT AND PHYSIOLOGICAL AGE

	Early	Late
	No. of berries	121
Percentage of seedless	2.5	62.5
No. of seeds	3,462	153
Mean seeds	28.6 (29.3)	3.8 (10.2)*

* Bracketed numbers include only fruits with seeds.

Table 2. RELATIONSHIP BETWEEN SEED CONTENT AND TREATMENT

Treatment	Fruits	Seeds	Distribution of berries with respect to seed content				Mean No. seeds per fruit
			0	10	11-30	+30	
(1)	2	—	2	—	—	—	
(2)	50	1,412	—	10	20	20	
(3)	23	50	16	5	2	2.5	
(4)	28	907	—	5	11	12	
(5)	58	1,238	10	11	20	17	

When the fruits matured, increased in size and changed colour, they were harvested and seed counts were made weekly (June 4–July 17). These data are presented as early fruit (harvested before June 15) and late fruit (harvested June 16–July 17) in Table 1. The seed content of fruits harvested from the various treatments is shown as Table 2.

The early fruit was heavily seeded, while the berries maturing later generally contained fewer seeds. The data of Table 1 indicate that only three berries that formed parthenocarpically had matured sufficiently for the early harvesting. None the less, treatment with GA resulted in a greater set response (84.3 per cent) than did hand pollination (62.3 per cent). Between the time when the set was estimated (14 days after treatment) and the date of harvesting, 58 per cent of the GA-induced fruits were lost. When the flowers were sprayed with GA and pollinated 24 or 48 h later, no parthenocarpic fruits were formed but ten seedless berries resulted from the application of GA subsequent to hand pollination.

The results of this work support the finding⁴ that physiological maturity in the blueberry is expedited by increased fertilizations. Furthermore it would seem that the stimulus to form fruits parthenocarpically from GA either is not quantitatively sufficient to permit ripening within the season, or incompletely substitutes for the natural stimulation to form berries that follows fertilization. These possibilities are indicated both by the lateness of maturing of the seedless fruits and by the high wastage of set berries.

GA can thus induce parthenocarpic response in the blueberry; however, it seems clear that the response that follows the application of this compound does not duplicate (at least in its entirety) the natural "berry-building" processes that stem from pollination and fertilization. Also the force of the response to GA depends on the clone treated.

These data support other observations that suggest a considerable variability in the setting of fruits in *V. angustifolium*. One clone at Tower Hill, New Brunswick, has never set fruit. Another produces large fruits, usually with a low seed count (4.2 seeds/fruit, this experiment). Some clones are natural parthenocarps.

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BIOLOGY

Influence of Oestrogen on the Loss of the Zona Pellucida in the Rat

IN the rat, the fertilized egg normally loses its zona pellucida about 10 h after it reaches the uterus. Blastocysts flushed from the uterine cavity before 12 a.m. on the fifth day after the onset of a positive smearing reaction are still surrounded by their zonae, but those flushed in the early afternoon of the fifth day have lost their zonae¹⁻³. Implantation begins some 6 h after the loss of the zona (110–114 h after ovulation)⁴.

When the ovaries are removed before noon on the fourth day of pregnancy, the blastocysts do not implant, but the zonae disappear at the normal time—that is on the afternoon of day 5. Blastocysts of ovariectomized animals treated with 5 mg progesterone also lose their zonae at this time and do not seem to differ from those of normal or untreated ovariectomized animals.

If the ovaries are removed on day 2 of pregnancy, however, and the rat is treated with 5 mg progesterone per day, the zona pellucida persists until the eighth day of pregnancy. In this period the blastocyst assumes a spherical shape owing to the enlargement of the embryonic cavity. On day 8 these blastocysts rupture their zonae but do not implant until oestrogen is given together with the progesterone. Unless oestrogen is supplied, the ruptured zona persists undissolved in the uterine cavity. The dose of oestrogen (17-*b*-oestradiol) required to bring about the dissolution of the zona is less than that (0.05 mg) required for implantation.

These results show that oestrogen is necessary for the dissolution of the zona pellucida in the rat. The loss of the zona pellucida at the normal time in animals ovariectomized on day 4 of pregnancy suggests that small quantities of this hormone are produced before the fourth day of pregnancy. The results also suggest that delayed implantation is not related to the persistence of the zona pellucida.

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