



Effect of GA₃ on Fruit Set and Yield of Young Southern Highbush Blueberry Plants

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Gibberellic acid is a plant growth regulator that affects plant cell division, expansion, and other processes. Gibberellic acid (GA₃) applied at flowering to highbush (*Vaccinium corymbosum* L.) and rabbiteye blueberry plants (*Vaccinium ashei* Reade) increases fruit set and yield under suboptimal pollination conditions, however, this response has been insufficiently tested on southern highbush blueberries. The authors applied GA₃ during 75 to 100% flowering to one-year-old ‘Emerald’ and ‘Meadowlark’ southern highbush blueberries, with six replicates of three plant plots per treatment. Treatments were either water, GA₃ at 40 fl oz/acre, or, GA₃ at 20 fl oz/acre applied twice, with the second treatment 14 days later. At harvest, total fruit weight per plant, fruit number, and average fruit weight were measured. Results verified that GA₃ has little to no effect on fruit set in two primary southern highbush blueberry varieties.

Gibberellic acid is a naturally occurring plant growth regulator that has several functions in plant growth and development (Suman et al., 2017). Both GA₄₊₇ and GA₃ have been shown to suppress flower bud initiation in highbush blueberry (*Vaccinium corymbosum* L.) when applied in late summer to young plants (Particka and Black, 2010) and GA₃ to increase fruit set and yield when applied at bloom (Mainland and Eck, 1969). GA₃ applied at bloom has been shown to increase fruit set and reduce individual fruit weight following freeze and physical injury in rabbiteye blueberry plants (*Vaccinium ashei* Reade) (NeSmith et al. 1995). Split applications of GA₃ increased fruit set over a single application depending on flower development stage of rabbiteye blueberries (NeSmith and Krewer, 1992). Multiple GA₃ applications during bloom increased fruit set and yield of rabbiteye blueberries, but the fruit were smaller and matured later (Williamson et al., 2008). Southern highbush blueberries are interspecific hybrids of *V. virgatum*, *V. corymbosum*, and *V. darrowi* and their response to GA₃ applications during bloom have not been well documented, although Williamson, et al. (2015) caution that GA₃ is not recommended for use on southern highbush blueberries in Florida because it may cause excessive fruit set. The objective of this research was to determine the effect of GA₃ applications to southern highbush blueberries at bloom in Florida.

Materials and Methods

One-and-a-half year old ‘Emerald’ and one-year-old ‘Meadowlark’ southern highbush blueberries grown in Tavares, FL, in Pomelo Sand soil hilled and amended with pine bark were selected for treatment. Rows were divided into six blocks of 27 plants for each cultivar and three treatments were randomized within each

block. Treatments were applied to nine plants in each block, but only the middle three plants were used for measurements. Treatments applied during 75 to 100% flowering, were either water, GA₃ (ProGibb LV Plus, Valent U.S.A.) at 40 fl oz/acre, or GA₃ at 20 fl oz/acre applied twice, with the second treatment 14 d later. Sprays were applied to run off with a backpack sprayer on 2 Feb. 2018 for ‘Emerald’ and 9 February 2018 for ‘Meadowlark’. The second of the split applications were made 14 Feb. and 23 Feb. 2018 to ‘Emerald’ and ‘Meadowlark’ respectively.

Ripe fruit were harvested from the middle three plants in each treatment replication four times from 6–24 Apr. 2018. On 26 and 27 Apr. all fruit were stripped from ‘Meadowlark’ and ‘Emerald’, respectively. Harvested fruit were weighed and counted, and average fruit weight calculated. Small green fruit that would not have been marketable were discarded before measurement at the strip harvest.

Data were analyzed using ARM2018.2 with analysis of variance (ANOVA) and mean separation using Tukey’s method *P* = 0.05.

Results

Measurements for ‘Emerald’ are reported in Table 1 as averages of harvests from three plants. Treatments had no significant effect on yield, berry number, or average berry weight. Measurements for ‘Meadowlark’ are reported in Table 2 as averages of harvests

Table 1. Effect of GA₃ on fruit set in ‘Emerald’ southern highbush blueberry.

Treatment	Total yield (oz. per plot)	Berry no.	Avg. berry wt. (oz)
Control	26.98	542	0.048
Single application	21.42	425	0.04
Split application	26.67	563	0.045

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Table 2. Effect of GA₃ on fruit set in ‘Meadowlark’ southern highbush blueberry.

Treatment	Total yield (oz. per plot)	Berry no.	Avg. berry wt. (oz)
Control	13.55 a ^c	282 a	0.048 a
Single application	6.13 b	145 b	0.040 b
Split application	16.22 a	358 a	0.045 ab

^cMeans within a column not followed by the same letter are significantly different at $P \leq 0.05$ with Tukey’s multiple range test (n = 6).

from three plants. A single application of GA₃ at the highest label rate reduced total yield, berry number, and average berry weight for ‘Meadowlark’, while split applications had no significantly different results than the untreated control.

Discussion

Gibberellic acid serves various functions in plant development and effects of exogenous application are determined by plant growth stage (Suman et al., 2017). Rabbit eye blueberries respond to GA₃ applied at bloom with increased fruit set (Williamson et al., 2008), but this response depends on flower stage, and at full bloom (stage 6) GA₃ applications exhibit decreased effect with increasing number of chill hours (NeSmith and Krewer, 1992).

These results indicate that southern highbush blueberries have a variable response to applications of GA₃ at bloom, possibly because of varying genetic makeup of the two cultivars or because of variation in total number of open flowers when applied (NeSmith and Krewer, 1992). GA₃ applications had no effect on ‘Emerald’ but had a negative to neutral effect on ‘Meadowlark’. Excessive fruit set was not seen as cautioned by Williamson (2015), however when the final strip harvest data is examined separately (Table 3), more fruit and greater total fruit weights were evident in the split application treatments than the control, and the negative impact of the single application of the highest rate on ‘Meadowlark’ can be seen. If all fruit had been

Table 3. ‘Emerald’ and ‘Meadowlark’ harvest data for final (5th) strip harvest.

Treatment	Emerald		Meadowlark	
	Total yield (oz per plot)	Berry no.	Total yield (oz per plot)	Berry no.
Control	7.78 b	209 b	4.93 b	138 b
Single application	6.50 b	181 b	3.25 c	95 c
Split application	12.27 a	331 a	7.80 a	219 a

^cMeans within a column not followed by the same letter are significantly different at $P \leq 0.05$ with Tukey’s multiple range test (n = 6).

harvested when ripe rather than stripped at the final harvest, Williamson’s prediction may have been correct. With this variable and sometimes insignificant response, it is likely not worthwhile for growers in Florida to spray southern highbush blueberries with GA₃ at flowering to increase set.

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