EFFECT OF FUNGICIDES ON GERMINATION OF LOWBUSH BLUEBERRY POLLEN AND ON NUMBER OF SEEDS PER BERRY[1]

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Introduction

Rich (3) and Eaton (1) have shown that certain fungicides have a marked effect on germination of apple and sweet cherry pollen. Recently Shawa et al. (4) have shown that fruit set of cranberry was reduced by ferbam (ferric dimethyldithiocarbamate) but not by zineb (zinc ethylenebis dithiocarbamate). For several years ferbam and zineb have been recommended for the control of blossom and twig blight in the lowbush blueberry, Vaccinium angustifolium Ait. (2). Because the blueberry is closely related to the cranberry and because fruit set has been a problem in the lowbush blueberry fields, it was of considerable interest to determine the effect of these fungicides on the germination of blueberry pollen. Additional data on the effect of these fungicides on the number of seeds per 50 berries per plot were determined in 1956. The fungicide plots were located at Tower Hill, N. B., and were replicated 4 times (2).

Materials and methods

Germination of pollen grains was determined by dusting the grains on a medium of 0.5% agar and 13.5% sucrose (Wood and Barker (5)). The per cent germination was recorded after 17 hours at room temperature. Fungicide concentrations for the tests were based an the rate of 15 pounds of dust per acre (2.9 kg/ha) of ferbam 7%, zineb 3.9% and ziram 7% (zinc dimethyldithiocarbamate). The fungicides were applied as follows:

(1) One-ml aliquots of microground fungicide, equivalent in concentration to a field application, were pipetted to the surface of agar medium in Petri dishes before application of pollen.

(2) For determining ED 50 values a dilution series of each fungicide was prepared and one-ml aliquots were assayed with pollen using the agar medium technique.

(3) In the greenhouse, lowbush blueberry flowers were dusted with fungicides using a small hand duster and their pollen was collected for germination tests.

(4) A fungicide-coated spatula was used to place pollen grains on the stigmas of lowbush blueberry flowers in the greenhouse.

For dry conditions the flowers were held in the greenhouse and for wet conditions the flowers were sprayed immediately following pollination and then held in a mist chamber. After 17 hours the blossoms were collected and smears of the style tips were made in a drop of water on a glass slide. Pollen germination was determined by microscopic examination. Smears of pollinated styles which received no fungicide served as controls. All tests were replicated and repeated at least twice.

Results and discussion

The ED 50 values show that the lowbush blueberry pollen will germinate on higher concentrations of zineb than that of ferbam or ziram (Table 1).

Little or no pollen germination occurred on artificial media which contained ziram or ferbam (Table 1). Moderate germination occurred on the medium that contained zineb. However, pollen from plants dusted with these fungicides germinated as well as the control (Table 1). As the pollen grains were enclosed in the anthers at time of dusting, the dust probably did not come in contact with the pollen.

In general, under dry conditions ferbam and ziram had some inhibitory effect on the germination of pollen but only ferbam resulted in a slight reduction in the percent of styles with pollen germ tubes (Table 2). Under wet conditions all 3 fungicides produced inhibition of germination, with zineb causing less inhibition of germination than ferbam or ziram. Although there was considerable variation in the number of pollen germ tubes per style, zineb appeared safer than ferbam or ziram.

Seed counts on 50 berries collected from replicated fungicide trial plots showed that the number of seeds in plots treated with fungicides were not significantly different from those in control plots (Table 3).

In view of the above experiments, the fungicide zineb appears to be safer to apply for the control of monilinia and botrytis blights of lowbush blueberry than ferbam or ziram.

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Table 1. The germination of lowbush blueberry pollen after 17 hours at room temperature

Fungicide treatment	ED 50 in ppm	Per cent germination" of pollen on artificial medium treated with fungicide	Per cent germination" of pollen from dusted plants
Zineb	200.0	21	100
Ferbam	5.6	1	100
Ziram	8.8	0	98
Control		100	97

" Averages based on duplicate counts of 100 pollen grains per treatment and tests repeated twice

Table 2. Per cent of lowbush blueberry styles with germinated pollen following pollination with pollen mixed with fungicide and held under dry or wet conditions

Fungicide treatment	Number of styles examined		Per cent styles with pollen germ tubes		Germ tubes per style		Per cent of pollen germinated	
	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Zineb	15	28	100	100	15-50	5-40	100	90'
Ferbam	16	33	94	91	4-30	3-35	90	65
Ziram	15	52	100	98	5-18	5-40	90	65
Control	25	37	100	100	10-60	10-50	100	100

Table 3. Number of lowbush blueberry seeds from fungicide plots

Fungicide treatment	Average number of seeds per plot
Ferbam	1075 a"
Zineb	1207 a
Thioneb**	1240 a
Control	1069 a

" Seed counts followed by same small letter indicate Duncan's Multiple Range grouping of treatments which do not differ significantly at the 5% level.

** Thioneb (polyethylene thiuram disulphide).

literature cited

1. Eaton, G. W. 1961. Germination of sweet cherry (Prunus avium L.) pollen in vitro as influenced by fungicides. Can. J. Plant Sci. 41: 740-743.
2. Lockhart, C. L. 1961. Monilinia twig and blossom blight of lowbush blueberry and its control. Can. J. Plant Sci. 41: 336-341.
3. Rich, A. E. 1957. Effect of various fungicides applied during bloom on apple pollination and fruit set. Agr. Chemicals 12: 64-66.
4. Shawa, A.Y., Doughty, C.C., and Johnson, F. 1966. Effect of fungicides on McFarlin cranberry pollen germination and fruit set. Proc. Am. Soc. Hort. Sci. 89: 255-258.
5. Wood, G. W., and Barker, W. G. 1964. Preservation of blueberry pollen by the freeze-drying process. Can. J. Plant Sci. 44: 387-388.