EVALUATION OF SIMULATED HAIL DAMAGE TO SEED CARROTS AND ONIONS IN CENTRAL OREGON, 1996

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Abstract

Research was conducted on commercial grown seed carrots and onions in central Oregon to determine the effect of simulated hail damage at 33% and 67% over two dates (beginning and end of pollination). There were no statistically significant differences between treatments. However, the trend was for the untreated plots to produce the largest yields and the late, heavy damage to produce the smallest yields. No difference in seed germination was observed between treatments.

Introduction

Vegetable seed production is an integral part of agriculture in central Oregon. Crops for the 1997 season included 2,500 acres of both carrots and garlic, 400 acres of onions, 200 acres of radishes, 450 acres of coriander, and 200 acres of both Chinese kale and flowers for a total acreage near 6,000. These high-value crops are the backbone of profitable production in the area.

Carrots are predominantly hybrid varieties grown in a single row per bed, with typically 4 rows of females and 2 rows of males with blank rows between. The primary (king) umbel is the first to develop, followed by the secondary umbels, and then the tertiary umbels. The primary umbel typically has the largest, most vigorous seed and accounts for 8-12% of production. Many carrot varieties continue to produce additional heads throughout the growing season.

Onions are largely hybrid varieties grown in double rows per bed, generally in a 6 row female, 2 row male configuration with a blank row between. Seed heads are generally 2-3 inches in diameter, and the plant has no way of compensating for damaged or destroyed heads by producing additional heads.

Methods and Materials

This is the first year of a multiple-year evaluation on the effect of simulated hail damage on seed carrots and onions. The study was conducted in commercial fields using the male rows of hybrid seed production. Plots were a single bed (1 row of carrots, 2 rows of onions) 15 feet in length, replicated 3 times in a randomized complete block design. Variables evaluated included timing and amount of damage. Treatments, applied with a weed eater held on edge to simulated hail damage from above, were applied July 13 and August 19, 1996 just prior to, and following, the introduction and removal of bees for

crop pollination. The five treatments included an untreated check, early light damage (33%), early heavy damage (67%), late light damage (33%), and late heavy damage (67%).

Plots were harvested on August 27 for the onions and September 17 for the carrots, just prior to commercial harvest. Mature heads in each plot were harvested by hand and allowed to dry in open containers. Samples were then cleaned using a rubbing board, appropriate-sized screens, and an air column to remove debris. The carrots were re-cleaned three times to progressively narrow the quality of the product. Seed was then tested for germination using 100 seeds per sample, placed in a growth chamber. Counts were taken weekly over a 4-week period.

Results and Discussion

The effect of the treatments on seed set for both onions and carrots is provided in Table 1. Onion seed production was reduced by 14% and 32% with one third and two thirds of the heads destroyed at the beginning of pollination. At the end of pollination one third and two thirds damage reduced seed yield by 42% and 50% compared to the undamaged plots. It would appear that onions are able to compensate for early damage, perhaps through increasing the size of remaining seed.

Carrot seed yields were not reduced with one third of the heads damaged at the beginning of pollination, but were reduced by 12% when two-thirds of the heads were destroyed. One third and two thirds damage following pollination reduced seed yield by 14% and 42%. The early damage had less influence on yield than later damage, as the plant was able to recover by producing additional umbels.

The amount of carrot seed from primary, secondary and tertiary umbels is shown in Table 2. Thirty-eight percent of seed yield is set by the primary umbels, while 50% came from the secondary umbels, and 12% from the tertiary umbels. If the stage of development is known when hail damage occurs, knowing the percentage of total yield contributed by each umbel level can provide an additional indicator of the amount of yield loss one would expect.

Table 1. Effect of 33 and 67% simulated hail damage applied with a weed eater July 13 and August 19 on seed onions near Madras, OR, 1996.

Treatment	Seed weight (grams)	Germination (percent)
Untreated	56 a'	98
Early late	46 a	97
Early heavy	25 b	97
Late light	44 a	96
Late heavy	41 a	94
		NS[2]

Treatments followed by the same letter are not statistically different from one another
[2]NS: no statistical difference between treatments with Student-Newman-Keuls Test at P 0.05.

Table 2. Effect of 33 and 67% simulated hail damage applied with a weed eater July 13 and August 19 on seed carrots near Madras, OR, 1996.

Treatment	Seed Weight				Germination
	lst clean	2nd clean	3rd clean	4th clean	
	(g)				(%)
Untreated	258	96	69	57	78
Early light	163	55	38	32	77
Early heavy	171	57	46	38	86
Late light	223	71	54	44	78
Late heavy	119	31	23	19	84
	NS'	NS	NS	NS	NS

'NS: no statistical difference between treatments with Student-Newman-Keuls Test at P 0.05.