EVALUATION OF SIMULATED HAIL DAMAGE TO SEED CARROTS AND ONIONS IN CENTRAL OREGON, 1999

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Abstract

This is the fourth year of a multi-year study to determine the effect of simulated hail damage on yield of seed carrots and onions. Timing and severity of damage were evaluated at the time of bee introduction with 33 percent and 67 percent damage, and at bee removal with 33 percent and 67 percent damage. Late season damage caused greater yield reductions than early season damage for both carrots and onions. For onions the amount of damage had more influence than timing on seed yield, while on carrots the timing of damage had more influence than the amount of damage on yield.

Introduction

Vegetable seed production is an integral part of agriculture in central Oregon. Crops for the 1999 season included 3,000 acres of garlic, 2,000 acres of carrots, 200 acres of onions, 100 acres of radishes, 450 acres of coriander, and 200 acres of Chinese brassicas for a total acreage over 6,000. These high value crops are the backbone of profitable agricultural 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 which is expected to account for 8-12 percent of production. Many carrot varieties continue to produce additional heads throughout the growing season.

All onions grown during 1999 were hybrid varieties grown in double rows per bed, generally in a 6-row female, 2-row male configuration with blank rows between. Seed heads are generally 2-3 inches in diameter, and the plant has no way of producing additional heads to compensate for ones that are damaged or destroyed.

Methods and Materials

This is the fourth year of a multiple year evaluation on the effect of simulated hail damage to seed carrots and onions. The study was conducted in commercial fields with plots place in the female rows. Plots were a single row x 10 ft for carrots and a single row x 5 ft for onion and chosen from uniform portions of the row to reduce variability. Treatments were replicated three times in a randomized complete block design.

Variables evaluated in this study included timing and extent of damage. The five treatments were an untreated check, early light damage (33%), early heavy damage (67%), late light damage (33%), and late heavy damage (67%). Damage was inflicted just prior to the introduction and following the removal of bees for crop pollination. Treatments were applied to the carrots with a weed eater on July 16 and August 26. Clippers were used on the onions to remove one third and two thirds of the heads on July 13 and August 19.

Onions plots were harvested on September 1, and the carrots were harvest on September 8. Mature heads in each plot were harvested by hand, and allowed to dry in open containers. In the untreated carrot plots, umbels were separated by position to determine the percentage of seed from primary, secondary, and tertiary umbels. Samples were processed at the seed-conditioning lab of the USDA-ARS National Forage Seed Production Research Center in Corvallis, Oregon.

Results and Discussion

Heavy damage both early and late significantly reduced onion seed weight per head (Table 1). Late damage reduced yields an additional 10 percent over early damage, while heavy damage reduced yields by about 50 percent over light damage. From these data it would appear that the amount of damage has more influence on yield of seed onions than the timing of the damage.

Yields for seed carrots were significantly reduced by late treatments whether they were light or heavy (Table 2). Heavy damage reduced yields by about 15 percent over light damage, while late damage reduced yields by over 40 percent compared to early damage. In carrots the timing of damage appears to have more influence on yield than the amount of damage based on these data.

With 26 percent of the seed from the untreated plots separated from the heads, it is difficult to determine with confidence the percent of seed attributable to the primary, secondary and tertiary umbels (Table 3). However, these data indicate 4 percent of the total seed comes from the primary, 33 percent from the secondary and 37 percent from the tertiary. Similar contributions to seed yield are provided by the secondary and tertiary umbels, with a smaller percentage appears to come from the primary umbels.

Percent germination for the 1999 season has not been completed. However, seed germination appeared to be unaffected by simulated hail treatments for either carrots or onions from previous year's data.

Table 1. Effect of 33 and 67 percent simulated hail damage applied with hand clippers on July 13 and August 19 on seed onions near Madras, Oregon, 1999.

	Seed weight per head	Percent of untreated
	(mg)	(%)
Untreated	1090 a	
Early light	1010 ab	92
Early heavy	440 be	40
Late light	880 abc	81
Late heavy	340 c	31

Table 2. Effect of 33 and 67 percent simulated hail damage to seed carrots applied with a weed eater July 16 and August 26 on seed carrots near Madras, Oregon, 1999.

	Seed weight	Percent of untreated
	(g)	(%)
Untreated	977 a	
Early light	962 a	99
Early heavy	817 a	84
Late light	569 b	58
Late heavy	404 b	41

Table 3. Portion of seed yield in untreated plots attributable to primary, secondary, and tertiary umbels near Madras, Oregon, 1999.

Umbel	Seed weight	Percent of total
	(g)	(%)
Primary	39	4
Secondary	33	33
Tertiary	365	37
Loose seed	252	26