

Project Report to the OPVC - 1988

TITLE: Effect of cultural practices on yield and head rot of broccoli

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PROJECT STATUS: Completed

FUNDING: \$7520

OBJECTIVES:

1. to evaluate the effect of plant spacing on yield and disease incidence in two broccoli cultivars
2. to evaluate the effect of frequency and amount of irrigation water on yield and disease incidence in three broccoli cultivars

PROGRESS REPORT:

Plant density experiment. Two cultivars, 'Gem' and the OSU line '86-3', were transplanted from the greenhouse into the field on April 18, 1988. Treatments included two between-row spacings (16 and 20 in) and three within-row spacings (6, 9, and 12 in). Each plot consisted of 4 rows, 15 feet in length. Treatments were replicated five times. At head initiation and every four days until harvest, an aqueous suspension of Erwinia carotovora was sprayed onto the plants. Heads were harvested on June 27, July 5, 13, and 20. Head weight and width, number of heads, and number of diseased heads were recorded.

As plant populations increased, broccoli yields increased from 6.8 t/a in the low population of 26,136 plants/acre to 8.5 t/a in the highest population of 65,340 plants/acre. Head weight was also affected by population density. Mean head weight decreased 34% as the population was increased (Table 1).

Incidence of downy mildew and head rot did not differ significantly among plant densities. Differences among treatments were observed, however, in percent of stalks with hollow stem. As the plant populations increased the incidence of hollow stem decreased from 59.9% to 24.4% (Table 2).

Yield did not differ significantly between the two cultivars. 'Gem' yielded 7.9 t/a while the OSU line '86-3' yielded 7.7 t/a. The OSU line yielded larger heads while 'Gem' yielded 23% more heads than the OSU line

offsetting the smaller head size. Differences were observed between cultivars in the incidence of disease with the OSU line developing more downy mildew and head rot. In addition, the OSU line had significantly less hollow stem than 'Gem' (Table 3).

Lab tests were conducted to determine if 'Gem' and the OSU line differed in their susceptibility to head rot. Broccoli heads were inoculated with a cell suspension of *E. carotovora*, placed in large jars, sealed, and flushed with nitrogen (N₂) to achieve an anaerobic environment. After six days, the heads were removed and the percent of rotted tissue was determined. No significant differences were observed between the cultivars in susceptibility to head rot. The higher incidence of head rot in the OSU line observed in the field studies may be due to more favorable environmental conditions at the time OSU heads were maturing. 'Gem' matured two weeks earlier than the OSU line. Also, the bacterium had a longer opportunity to infect the OSU line because the heads developed more slowly.

Irrigation experiment. The cultivars 'Gem', 'Citation' and the OSU line '86-3' were transplanted into the field on July 27. Each plot consisted of four rows, 12 ft in length. Seedlings were spaced 9 in. apart within rows on 16 in. centers. Treatments were replicated six times. All plots received the same amount of water until one week prior to head initiation. At that time two experiments were established using two separate irrigation line sources. The low frequency experiment received water once a week for approximately 9 hr while the high frequency experiment received water three times a week for approximately 2.5 hr each time. At each irrigation the amount of water applied was measured for each plot and totaled at the end of the season. At head initiation and at four day intervals an aqueous suspension of *E. carotovora* was applied to the plants. Heads were harvested September 28, October 6 and 13. Head weight and width, number of heads, number of diseased heads, and weight of diseased heads were recorded.

Irrigation data are currently being analyzed.

Biological and chemical control experiments. Five potential biological control agents (*Pseudomonas* spp.), two copper based compounds (Kocide 101 and Nordox) and a fungicide (Ridomil/Bravo 81 W) were evaluated for control of head rot in five commercial fields in Marion County.

Each plot consisted of a two or four row bed, 20 ft long. Treatments were replicated four times. At head initiation, compounds and biocontrol agents were applied with a CO₂-pressurized, backpack sprayer at 30 psi in 40 gal of water/acre. Prior to harvest, heads were assessed for symptoms of head rot. Head rot failed to develop in any of these trials.

SUMMARY:

The population study again indicates the necessity of maintaining high plant populations to achieve economic yields. Yield responses to plant populations were similar in 1987 and 1988. Plant density had little affect on head rot development.

Cultivar was an important factor in disease development. The OSU line '86-3' developed more head rot and downy mildew, though this was probably due to the time of maturity more than susceptibility factors.

Table 1. Effects of plant population on yield of broccoli, 1988.

Population per acre	Spacing		Yield (T/A)	Head wt. (oz)
	Between-row (in)	Within-row (in)		
65340	16	6	8.5	6.4
52272	20	6	8.6	7.3
43552	16	9	8.3	8.0
34848	20	9	6.8	8.3
32670	16	12	7.8	8.6
26136	20	12	6.8	9.7

Table 2. Effects of plant population on incidence of head rot, downy mildew, and hollow stem of broccoli, 1988.

Population per acre	Downy mildew (%)	Head rot (%)	Hollow stem (%)
65340	15.2	15.3	24.4
52272	10.0	17.7	29.9
43552	8.2	19.1	43.9
34848	12.3	26.2	37.6
32670	6.5	13.4	53.2
26136	7.3	16.9	59.9

Table 3. Effects of cultivar on yield and incidence of head rot, downy mildew, and hollow stem of broccoli, 1988.

Cultivar	Yield (T/A)	Head weight (oz)	Downy mildew (%)	Head rot (%)	Hollow stem (%)
OSU line	7.7	8.6	17.1	29.6	19.8
Gem	7.9	6.8	2.3	5.3	64.2