

Project Report to the OPVC - 1987

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

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PROJECT STATUS: Continuing; projected completion date, 1988

FUNDING: \$7500

OBJECTIVES:

1. to evaluate the effect of plant spacing on yield and disease incidence in broccoli
2. to evaluate the effect of frequency and amount of irrigation water on yield and disease incidence in three broccoli cultivars
3. to evaluate the efficacy of Kocide 101 on control of head rot of broccoli under different irrigation regimes

PROGRESS REPORT:

Plant density experiment. The broccoli cultivar 'Gem' was transplanted on April 16, 1987. Treatments included two between-row spacings (16 and 20 in) and four in-row spacings (6, 8, 10 and 12 in). Each plot was a 4-row bed, 15 feet in length. Treatments were replicated six times. At head initiation and one week later, an aqueous suspension of Erwinia carotovora was sprayed onto the plants. Heads were harvested on June 15 and 23. Head weight, number of heads, and number of diseased heads were recorded.

Yield did not differ significantly among plant populations at the first harvest but did differ significantly at the second harvest. For both harvests, average head size increased as plant population decreased (Table 1). Head size increased 35% from the highest plant population to the lowest population. Though head size was greater in the lower plant populations, it was not enough to maintain the same yields as in the higher populations. Yields increased from 6.6 tons/acre at 26,000 plants/acre to 10.0 tons/acre at 65,000 plants/acre, an increase of 34%.

Head rot did not develop in this experiment. Weather conditions were not favorable for disease development. Although water formed on heads from morning dew, it quickly evaporated.

Irrigation Experiment. The cultivars 'Gem', 'Citation', and an OSU line were transplanted into the field on July 27. Each plot consisted of a four row bed, 12 ft in length. Seedlings were spaced 10 in apart within rows on 16 in centers. Treatments were replicated six times. All plots received the same amount of water until two weeks prior to head initiation. At that time two line irrigation sources were established. One set of plots was watered once a week for 9.5 hr while the other set of plots was watered three times a week for 2.5 hr each time. Three moisture levels were established within each frequency: high (0.75 in/wk), medium (0.5 in/wk), and low (0.25 in/wk). At head initiation and at weekly intervals, an aqueous suspension of Erwinia carotovora was applied to the plants. Heads were harvested on Sept. 28, Oct 6 and 12. Head weight and width and disease were recorded.

Irrigation frequency had little effect on disease or yield. However, the incidence of downy mildew and head rot tended to be greater with more frequent irrigation.

The highest amount of water applied produced the highest yields. The lowest amount of water applied consistently produced the lowest yield and mean head size. Head rot and downy mildew were also affected by the amount of water. The lowest amount of water applied produced significantly less head rot and downy mildew than the higher amounts.

There were significant differences in yield and disease among cultivars (Table 2). The OSU line was the latest maturing cultivar and had the lowest overall yield. Citation had highest yield and quality. Gem was more susceptible to head rot than the other two cultivars (Fig 1) and was also the most susceptible to downy mildew (Fig 2).

Biological and chemical control experiment. Five potential biological control agents (Pseudomonas sp. and Erwinia herbicola) and two copper based compounds (Kocide 101 and Nordox) were evaluated for control of head rot in seven commercial fields in Marion County and at the North Willamette Experiment Station.

In the commercial fields, each plot was 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.

At the experiment station, each plot consisted of a four row bed, 12 ft long. The two irrigation frequencies described above were established two weeks prior to head initiation. Biological control agents were applied to the plants at head initiation. The following day, plants were sprayed with a

suspension of Erwinia carotovora. Heads were harvested on October 13 and number of diseased heads was recorded.

Head rot developed in 2 of the 7 commercial fields and in plots at the experiment station. No treatment, however, was effective in reducing the amount of head rot.

SUMMARY

The population study again indicates the necessity of maintaining high plant populations to achieve economic yields. No head rot developed in this experiment, but the 1986 trial indicated that reducing plant populations reduces head rot only at non-economic yield levels. Yield responses to plant population were similar in 1986 and 1987.

The irrigation frequency and amount of water study indicated that cultural practices can affect disease incidence in broccoli. Increased irrigation frequency and amount of water applied tended to increase both head rot and downy mildew. However, the irrigation level required to reduce the amount of disease also reduced yield. Nevertheless, these results strongly support the desirability of allowing a field to dry out between irrigations, and demonstrated that overhead irrigation will increase disease problems.

Cultivar was shown to be an important factor in disease development. The industry standard 'Gem' appeared more susceptible to head rot and downy mildew than alternative cultivars.

Head rot was not affected by any of the bactericides or antagonists. Chemical control may not be feasible but these results indicate that materials must be present before infection by E. carotovora to have any effect.

SIGNATURES

Project Leaders Redacted for Privacy

Redacted for Privacy

Department Head Redacted for Privacy

Redacted for Privacy

Table 1. Effect of plant population on yield of broccoli for both harvests, spring planting, 1987.

Population per acre	Spacing		Yield (T/A)	Head wt. (oz)	Downy Mildew (%)
	Between-row (in)	In-row (in)			
65340	16	6	10.0	6.4	6.4
52272	20	6	9.0	7.1	9.6
49005	16	8	8.0	7.4	7.5
39204	20 (16)	8 (10)	8.3	8.2	10.6
32670	16	12	6.8	8.4	7.0
31362	20	10	8.4	10.6	10.5
26136	20	12	6.6	9.8	3.6
LSD (P=0.05)			2.4	2.1	NS

Table 2. Main effects of amount of irrigation water and cultivar on yield, head size and disease incidence in broccoli, 1987.

Treatment	Yield (T/A)	Head wt. (oz)	Head rot (%)	Downy Mildew (%)
<u>Amount</u>				
Low	7.0	8.1	1.6	11.0
Medium	7.4	10.3	5.7	15.9
High	8.4	9.7	3.2	15.6
LSD (P=0.05)	0.4	1.0	1.5	2.4
<u>Cultivar</u>				
Citation	8.7	10.1	2.0	12.5
Gem	8.0	8.9	5.0	22.3
OSU line	6.1	9.0	3.6	7.7
LSD (P=0.05)	1.5	0.7	1.3	6.2

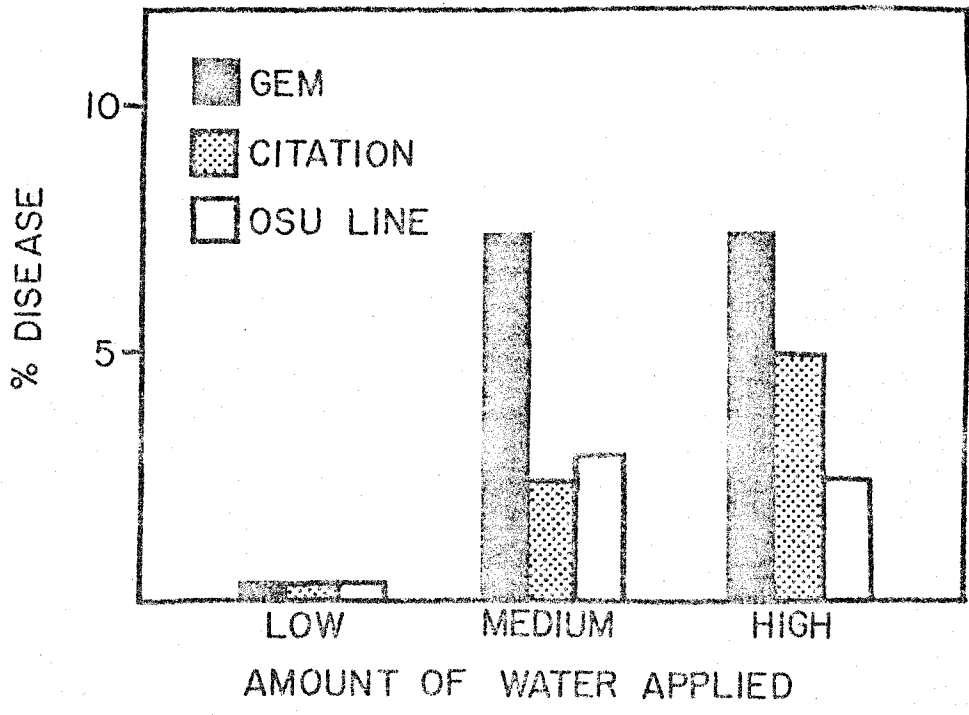


Figure 1. Effect of irrigation on incidence of head rot in three broccoli cultivars from the second harvest, fall planting, 1987

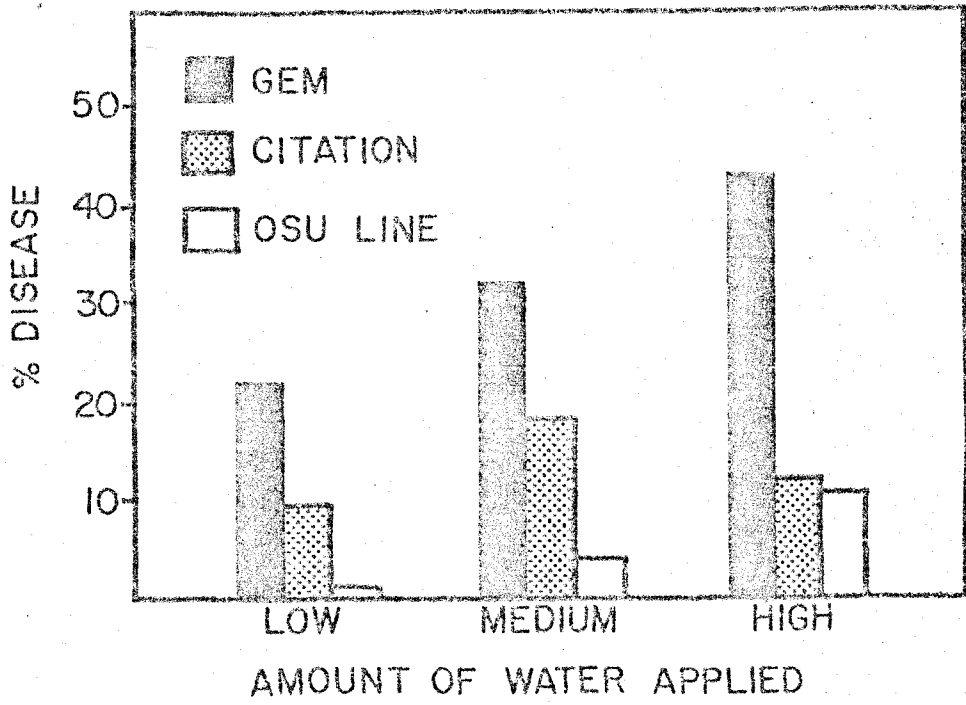


Figure 2. Effect of irrigation on incidence of downy mildew in three broccoli cultivars from the second harvest, fall planting, 1987