REPORT TO THE OREGON PROCESSED VEGETABLE COMMISSION, 1997-1998

TITLE: Long-Term Vegetable Crop Rotation Study

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PROJECT STATUS: Continuing

FUNDING: $3,000 in 1997-98 from OPVC. Additional funding from OSU and ODA. Funds spent for fertilizers; soil and tissue analysis; sample collection; labor for plot establishment, maintenance and harvest; travel, Corvallis to Aurora.

OBJECTIVES FOR 1997:

1. To evaluate effects of several winter cover crop systems, including fall-seeded and overseeded triticale, fall-seeded triticale plus winter pea, and overseeded red clover on yield and quality of broccoli at three rates of N. The cover crops followed sweet corn fertilized with three rates of N in 1996.
2. To evaluate the effect of these cover crops on the amount of soil mineral N available to the broccoli crop at sidedressing time.
3. To evaluate the effect of these cover crops and the N applied to sweet corn in 1996 on the amount of nitrate leached below the root zone.

PROGRESS REPORT:

1. Nitrogen Rate and Cover Crop on Broccoli Yield

During winter the plots had been fallow, or in the cover crops listed under Objectives. The cover crops had been interseeded into standing sweet corn in July 1996 or were broadcast-seeded and scratched into the soil in early October, 1996. While we did not consider this an outstanding cover crop in terms of biomass accumulation, the plots seeded to cover crops in October had significantly greater ground cover than did fallow plots, when measured in January (Table 1).

'Packman' broccoli was seeded on 3 July in rows 30 inches apart. Two previous seedings of 'Pirate' failed due to inadequate stands. Plot size was 600 sq. ft. Nitrogen rates were 0, 125, and 250 lb/acre, with half the N applied just after seeding and the remainder applied 5 weeks after seeding. At this time the appropriate plots were overseeded to triticale or red clover in preparation for the 1998 experiments. Harvest was on 16 Sept.

Both yield and mean head weight tended to decline following an overseeded triticale cover crop, regardless of N rate (Table 2). This result is consistent with those dating back to 1990 for both triticale and cereal rye cover crops. The overseeded clover cover crop tended to increase yield but the effect was not statistically significant. However, mean head weight was significantly increased with the overseeded clover. Yield with fall-seeded triticale tended to be higher than following fallow and mean head weight was significantly improved by the fall-seeded triticale. In past years fall-seeded cereal cover crops have always

tended to depress yield. Results from this year may indicate that soil available N content has increased sufficiently with continuous cover-cropping to provide some yield boost to the following vegetable crop. Initial pea stand in the triticale/pea cover was adequate but the stand was lost during the late winter. Therefore, yield did not increase with this cover crop over that obtained with triticale alone. There was no response to rate of N applied, when averaged over cover crop treatments. The highest-yielding treatment combination was the intermediate rate of applied N following the fall-seeded triticale/pea cover, with 5.2 tons/acre (Fig. 1). Largest mean head size was obtained with the combination of fall-seeded triticale and no applied N (Fig. 2). Lowest yield and head weight was with overseeded triticale and no applied N.

2. Winter Cover Crops and N Rate on Mineralization of Soil N.

We have obtained limited information on the impact of cover crops and N rate on size distribution of soil aggregates, distribution of microbial activity across aggregate sizes, and the effect of cover crops and N rate on mineralization potential of soil aggregates. Cover crops had no effect on aggregate size distribution to date. Nitrogen mineralization potential of aggregates appears to be increased with higher N rate and with the overseeded cover crop.

3. Winter Cover Crop on Nitrate Leaching.

A fall-seeded triticale cover crop significantly reduced the nitrate concentration of leachate reaching the 4-foot depth in the soil profile following the 1996 corn crop (Fig. 3). The difference in nitrate-N concentration in the leachate was small during the high-rainfall months of December and January but the amount of water percolating past the root zone was also reduced by the cover crop, resulting in a dramatic effect on the amount of nitrate being leached (Fig. 4). By April, the amount of nitrate lost from the root zone was 33 lb N/acre for the fallow plots versus 18 lb/acre for the cover crop plots. This is very consistent with results obtained in the winters of 1992-93 through 1995-96. Over the five winters that we have obtained data from the passive capillary lysimeters, the reduction in mass of nitrate leached has averaged 45 percent. This demonstrates the ability of even a relatively sparse cover crop to significantly impact ground and surface water quality.

SUMMARY

Consistent with past results, winter cover crops reduced leaching of nitrate from the root zone. Leguminous cover crops made N available to the following vegetable crop but a cover crop consisting only of an overseeded winter grain tended to depress yield of the following broccoli crop. In contrast to previous years, a fall-seeded triticale cover crop tended to increase yield. Continuous cover cropping has had no measurable effect to date on soil aggregate size distribution.

Table 1. Effect of cover crop on percentage of ground covered, January, 1997

Cover crop	% Triticale	% Legume	% Weeds	% Total
Fallow	0	1	34	35
Overseeded triticale	12	0	30	42
Overseeded clover	0	21	25	46
Fall-seeded triticale	36	1	30	67
Fall-seeded triticale/pea	20	29	18	66
LSD (0.05)	14	7	15	17

Determined by string method on 6 Jan., 1997.

Table 2. Main effects of preceding cover crop and rate of applied N on yield of broccoli, NWREC, 1997

Treatment	Yield (T/A)	Mean head wt. (g)
Cover crop (avg. over N rates)		
Fallow	3.5	349
Overseeded triticale	2.6	236
Overseeded clover	4.3	407
Fall-seeded triticale	4.1	466
Fall-seeded triticale/pea	4.4	408
LSD (0.05)	NS	22
N rate, lb/acre (avg. over covers)		
0	3.8	383
125	4.0	375
250	3.9	361
LSD (0.05)	NS	NS

SIGNATURES

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Project Leader

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Department Head

Fig. 1. Cover Crop and N Rate on Broccoli Yield, NWREC, 1997

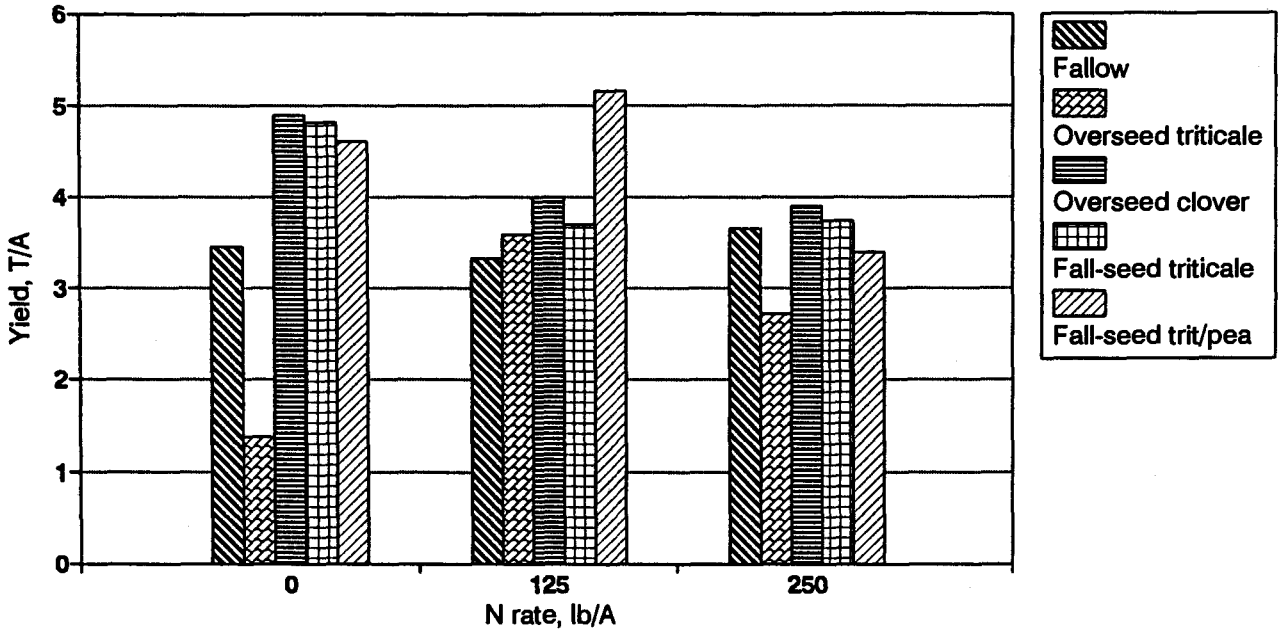

Fig. 2. Cover Crop and N Rate on Broccoli Mean Head Weight, NWREC, 1997

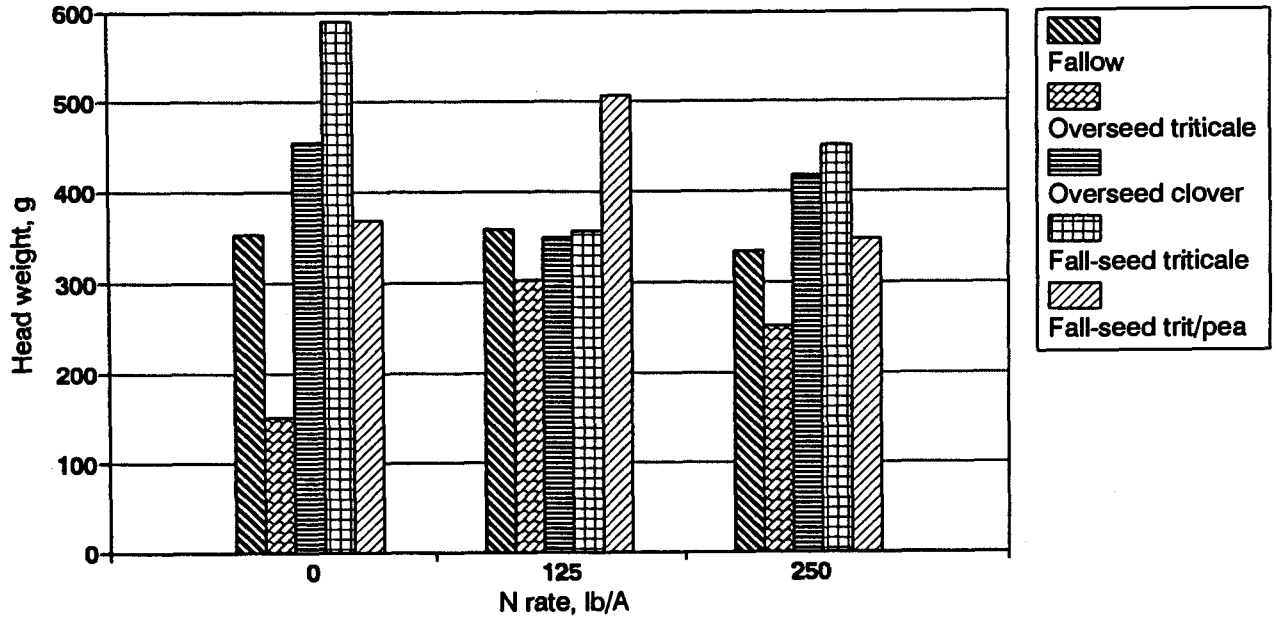

Fig. 3. 1996-97 Cover Crop on Nitrate Concentration in Leachate, High N

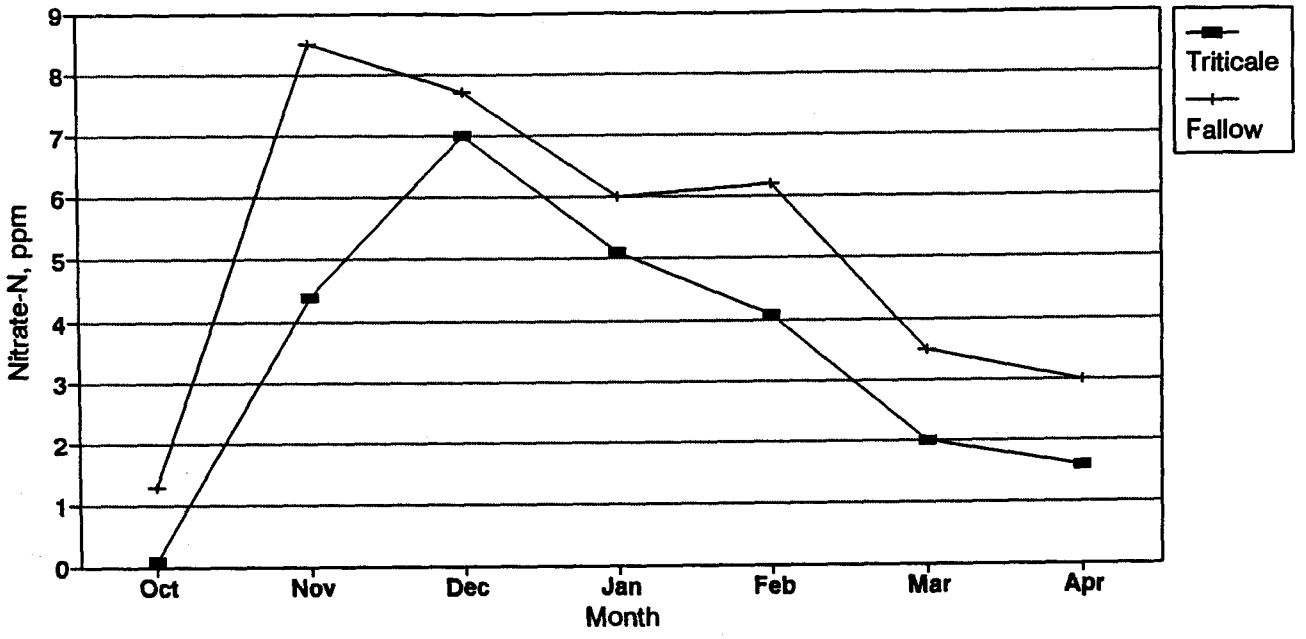

Fig. 4. 1996-97 Cover Crop on Amount of Nitrate Leached, High N