2005 Report to the Oregon Processed Vegetable Commission
TITLE: Cultural management of corn root rot.

Reports:

1. **Rotbusters field survey**
2. **High biomass cover crop field trials**

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SUMMARY:

1. Rotbusters Field Survey.

- ✓ Kokanee and Basin were the only varieties sampled in 2005. There was a significant relationship between radicle rot severity and gross yield for Kokanee but not for Basin.
- ✓ In previous years, we have shown that for Jubilee, approximately 3 tons of gross yield are lost in fields of very high root rot potential compared to those of very low root rot potential. We have also shown that Coho and SSJ+ lose about half that, or about 1.5 tons. In 2005, across all fields scouted, approximately 1.5 tons of gross yield in Kokanee were lost when this variety was planted into fields of very high root rot potential relative to planting into fields of very low root rot potential.
- ✓ Kokanee, Coho and Basin are higher yielding than either Jubilee or SSJ+, regardless of the root rot potential of the soil.

2. Impacts of High Biomass Cover Cropping on Root Rot and Yield of Sweet Corn.

- ✓ In a research station replicated field trial, no late summer or winter cover crop treatments significantly suppressed root rot or increased yield of sweet corn.
- ✓ In a pseudo-replicated on-farm trial, all winter cover crop treatments (oats “Saia”, arugula “Nemfix” and mustard mix “Caliente” strongly suppressed nodal root rot of sweet corn but had no significant effect on sweet corn yield.
- ✓ It is likely that the effects of cover crops on root rot and yield of sweet corn are the combined result of the effects of cover crop management on microbial activity (general suppression), nitrogen mineralization, plant available water, and possibly other soil factors. More work is required to better understand how to best manage high biomass cover crops to improve sweet corn productivity.

1. ROTBUSTERS FIELD SURVEY

Methods:

Rotbusters 2005 sweet corn field survey:

Corn field locations, varieties, planting dates, and yields were obtained from field representatives from Norpac and National Frozen Foods. A total of 48 fields (25 Basin and 23 Kokanee) were evaluated for radicle rot severity and gross yields were collected for those fields. Varieties included Kokanee (2684) and Basin. Fields were sampled when the corn reached the 6 leaf stage. A total of sixteen corn plants were sampled randomly from each field (2 subsamples, 8 plants per subsample). Roots were removed from the field using a garden shovel. Soil was shaken from the root ball and the radicle of each plant was collected. Radicles from each field were bagged,

refrigerated, and washed and rated within 48 hours. Each radicle was evaluated on a 0-8 scale, where 0 = 100% healthy, 1 = 1-10% necrotic, 2 = 11-20%, 3 = 21-40%, 4 = 41-60%, 5 = 61-80%, 6 = 81-90%, 7 = 91-99%, and 8 = 100% necrotic. A mean radicle necrosis (percent necrosis) was generated for each field. Gross yields for each field were obtained from the processors.

Results:

Kokanee and Basin were the only varieties sampled in 2005. There was a significant relationship between radicle rot severity and gross yield for Kokanee but not for Basin (Fig. 1). In previous years, we have shown that for Jubilee, approximately 3 tons of gross yield are lost in fields of very high root rot potential compared to those of very low root rot potential. We have also shown that Coho and SSJ+ lose about half that, or about 1.5 tons (Fig. 2). In 2005, across all fields scouted, approximately 1.5 tons of gross yield in Kokanee were lost when this variety was planted into fields of very high root rot potential relative to planting into fields of very low root rot potential. Kokanee, Coho and Basin are higher yielding than either Jubilee or SSJ+, regardless of the root rot potential of the soil (Fig. 2; Rotbusters report 2004).

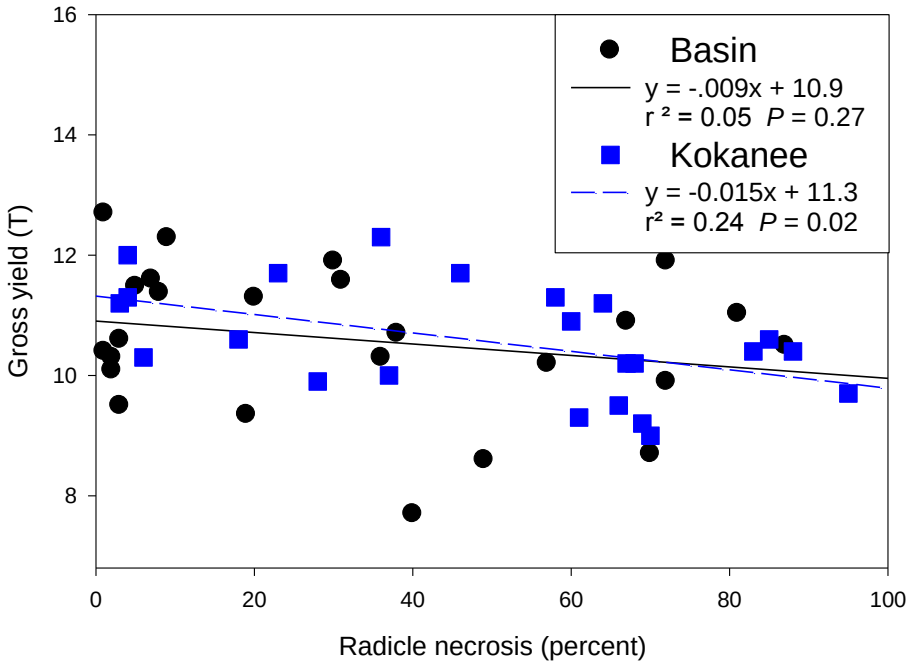

Fig. 1. Radicle rot severity and gross yield: Basin and Kokanee 2005

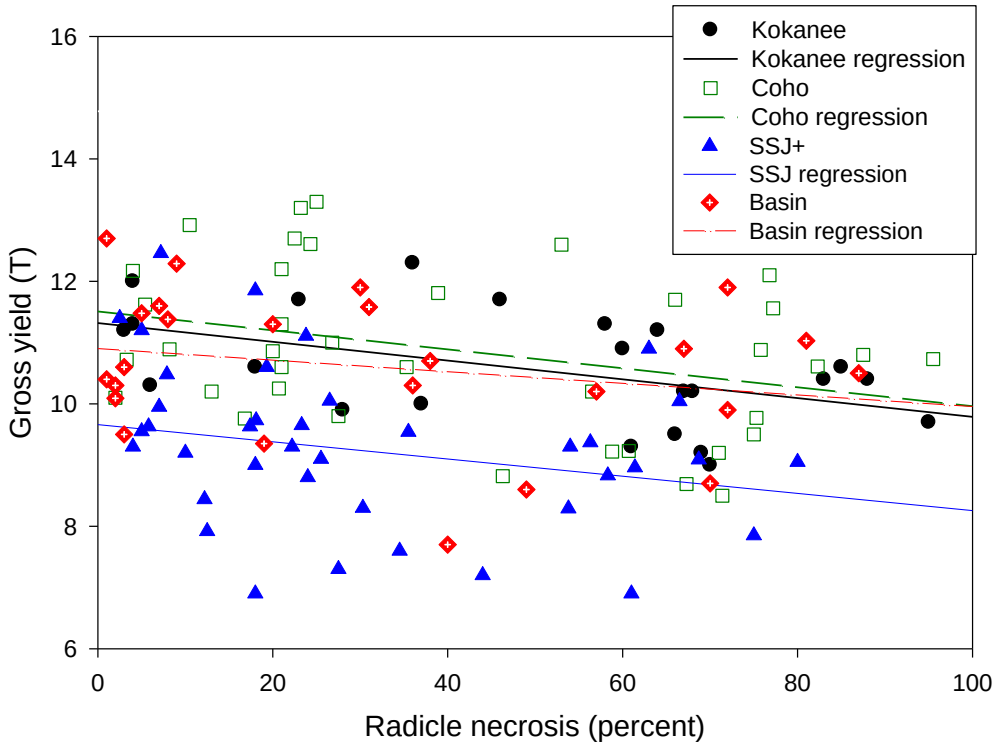

Fig. 2. Radicle rot severity and gross yield: Kokanee, Coho, SSJ+ and Basin

2. IMPACTS OF HIGH BIOMASS COVER CROPPING ON ROOT ROT AND YIELD OF SWEET CORN.

2A. Oregon State University Vegetable Research Farm replicated cover crop field trials.

Methods:

Two field trials (a late summer cover crop trial and a winter cover crop trial) were established at the OSU vegetable research farm in late summer and fall of 2004 (6 blocks, 4 treatments, randomized complete block design, 40' x 20' plots). In both trials the treatments were: 1) fallow (no cover crop), 2) rape "Dwarf Essex", 3) oats "Saia", and 4) mustard mixture "Caliente". Cover crops were sown on August 19 and September 29 for the late summer and winter cover crop trials, respectively. Both mustards were seeded at 15 lbs per acre for the summer trial and at 12 lbs per acre for the winter trial. Oats were seeded at 110 lbs per acre for the summer trial and at 80 lbs per acre for the winter trial. Dry biomass was evaluated by harvesting and drying aboveground biomass from 3, 0.5m^2 quadrats per plot. Late summer cover crops were flailed and incorporated on October 14, 2004. The winter cover crops were flailed and incorporated on April 6, 2005. Sweet corn "Reward" was planted on June 6 and harvested August 22, 2005. Corn was fertilized at planting and side-dressed at the 6 leaf stage according to OSU sweet corn fertilization recommendations. Radicle rot severity was evaluated at 3, 6, 9, and 15 weeks after planting. Nodal root rot was evaluated at 6, 9, and 15 weeks after planting. Three complete plants (aboveground

biomass and root ball were removed from each field plot at each sampling date using a garden shovel. Aboveground biomass was dried and weighed. Soil was shaken from the root ball and the radicle and nodal roots of each plant were collected and washed. Each radicle and nodal root was evaluated on a 0-8 scale, where 0 = 100% healthy, 1 = 1-10% necrotic, 2 = 11-20%, 3 = 21-40%, 4 = 41-60%, 5 = 61-80%, 6 = 81-90%, 7 = 91-99%, and 8 = 100% necrotic. Mean radicle and nodal root necrosis (percent necrosis) were generated for each plot. Yield was determined by harvesting and weighing all marketable ears (at least 6" of filled kernels) in two 10' row sections per plot.

Results:

Cover crop biomass:

Dry biomass in the late summer planting for the rape, mustard mix, and oats, was 3.7, 4.6, and 4.9 dry tons per acre, respectively (data not shown). Dry biomass in the winter planting for the rape, mustard mix, and oats, was 3.6, 4.6, and 2.6 dry tons per acre, respectively (data not shown).

Root rot:

Radicle and nodal root rot severity increased over time in all plots. There were no significant treatment differences in radicle or nodal root rot severity at any time (Fig. 3 a and b and Fig. 4 a and b). Nodal root rot severity was generally numerically lower in cover cropped than in fallow treatments later in the growing season (Figs. 3b and 4b).

Corn aboveground biomass and yield: There were no significant treatment differences for aboveground corn biomass or yield in the late summer field trial (Figs. 5 a and b; Table 1). Yield data from the winter cover crop trial is not shown as 12 spot beetle larvae selectively killed many of the corn plants in the winter cover crop fallow plots, effectively reducing the stand and yield. Biomass of corn grown in the oat cover crop treatment was numerically lower in both the late summer and winter trials.

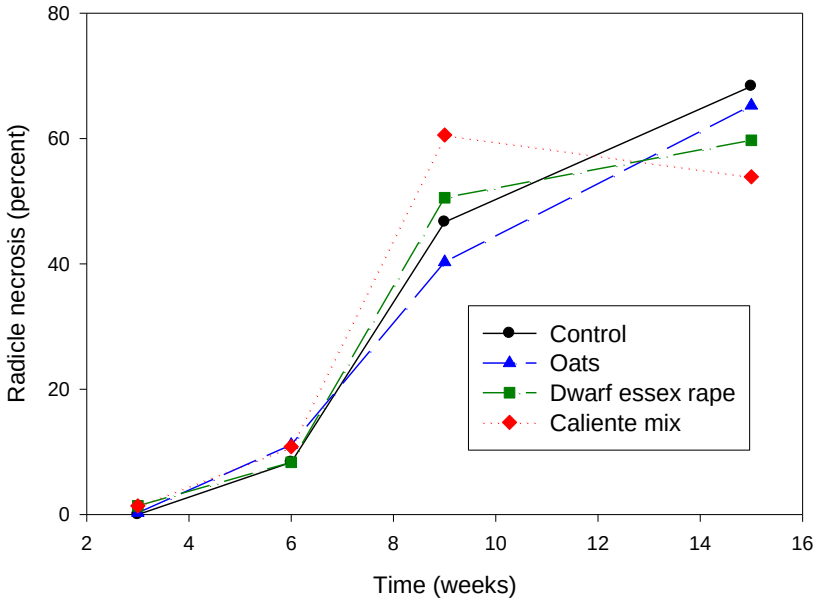

Fig. 3a. Radicle rot severity over time in OSU late summer cover crop field trial.

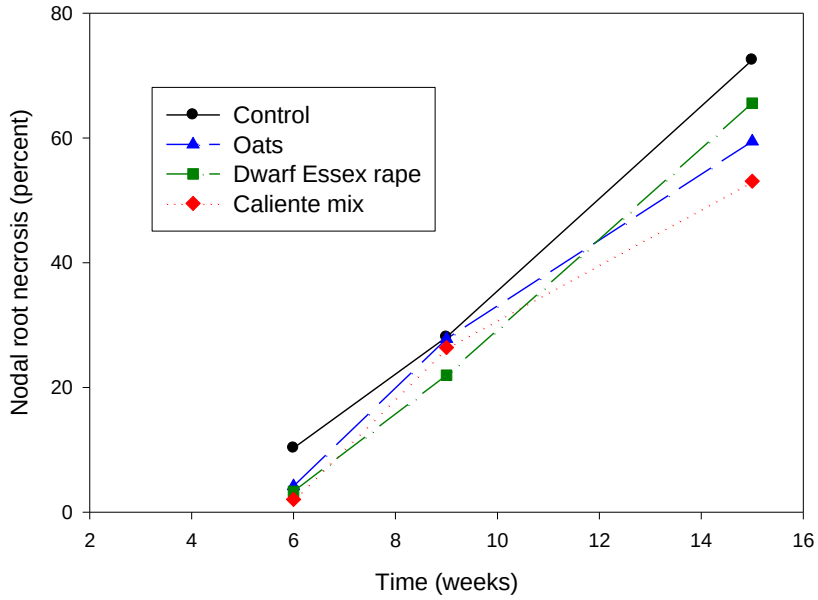

Fig. 3b. Nodal root rot severity over time in OSU late summer cover crop field trial.

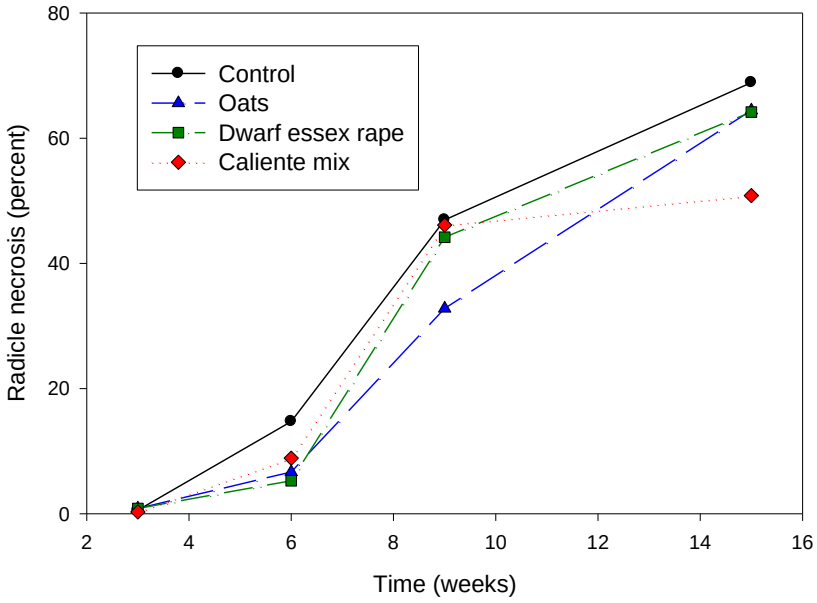

Fig. 4a. Radicle rot severity over time in OSU winter cover crop field trial.

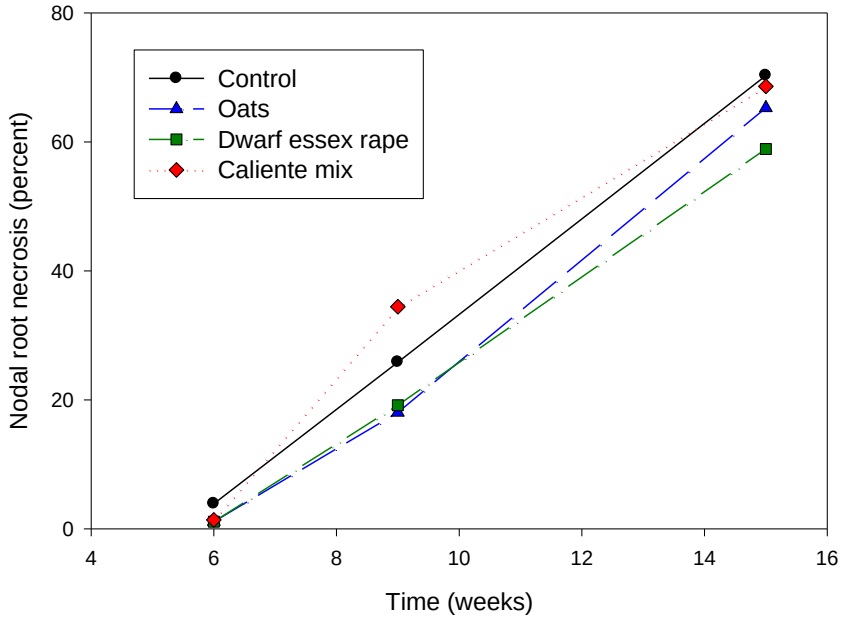

Fig. 4b. Nodal root rot severity over time in OSU winter cover crop field trial.

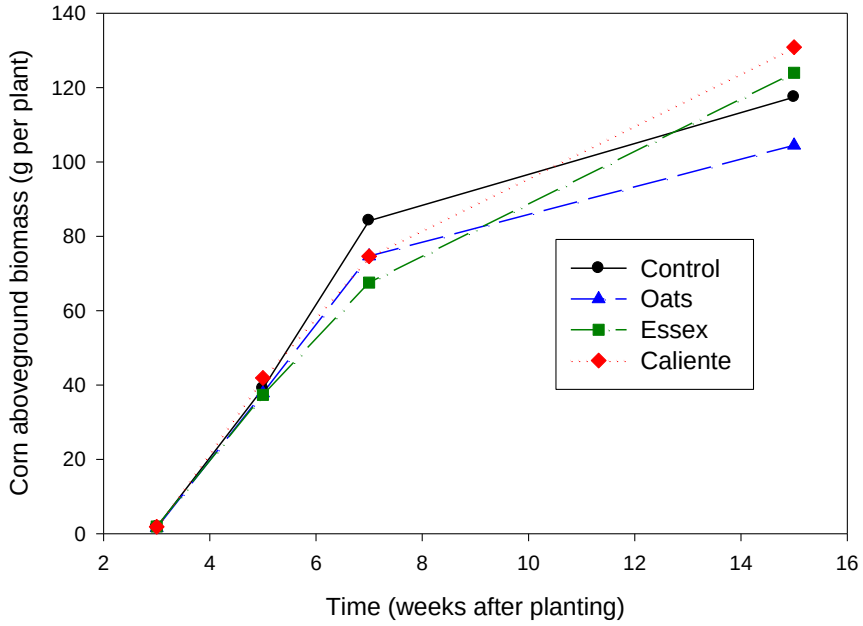

Fig. 5a. Aboveground corn biomass OSU late summer cover crop field trial.

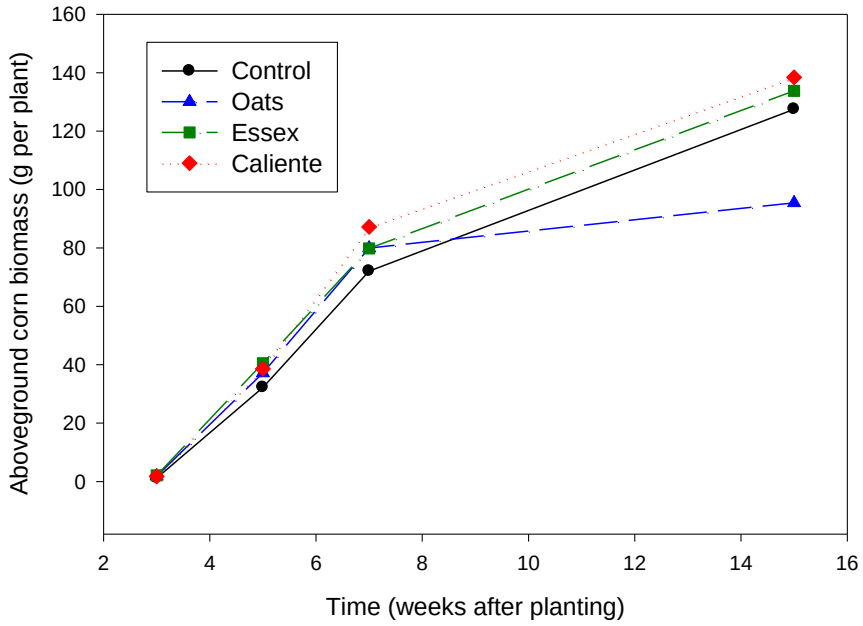

Fig. 5b. Aboveground corn biomass OSU winter cover crop field trial.

Table 1. Late summer OSU cover crop trial: yield (g per 20 row ft.)

Treatment	Yield (g/20 row ft.)
Control (fallow)	9875
Rape “Dwarf Essex”	9668
Mustard mix “Caliente”	10043
Oats “Saia”	9731
P=0.05	NS

2B. Kenagy Family Farm pseudo-replicated on-farm trial
Methods:
A pseudo-replicated field trial was established at Kenagy Family Farm on September 15, 2004. Treatments included: fallow (oats sprayed out in February), oats “Saia” incorporated, arugula “Nemfix” incorporated, and mustard mix “Caliente” incorporated. Treatments were imposed across a center pivot field in 50-60 ft swaths. Swaths were divided across the length of the field into 3 pseudo-replicates. Cover crops were flailed and incorporated on March 25, 2005. Sweet corn “SSJ+” was planted June 23, 2005. Fifteen entire plants were collected at 3, 6, 9, and 15 weeks after planting. Radicle and nodal roots were washed and evaluated for disease severity as described previously. All fifteen plants were weighed wet and two plants were dried for moisture content. Corn was hand-harvested on September 23, 2005. All marketable ears were harvested from 15 plants per pseudo-plot.

Results:

Root rot:

Radicle rot severity was significantly lower (*P*=0.06) in the arugula treatment than in the fallow at 6 weeks after planting(Fig. 6a). Both the arugula and the incorporated oat treatments were significantly different (*P*=0.04) at 15 weeks after planting (Fig. 6a).

Nodal root rot severity was significantly lower (*P*=0.02) in the arugula and both oat treatments than in the fallow at 9 weeks after planting (Fig. 6b). Nodal root rot severity was significantly lower (*P*=0.01) in all cover crop treatments than in the fallow at 15 weeks after planting (Fig. 6b).

Aboveground biomass and yield:

There were no significant treatment differences in aboveground biomass or yield at any time (Fig. 7; Table 2). However, the aboveground biomass of the corn grown in the incorporated oat treatment was numerically lower than in the other treatments.

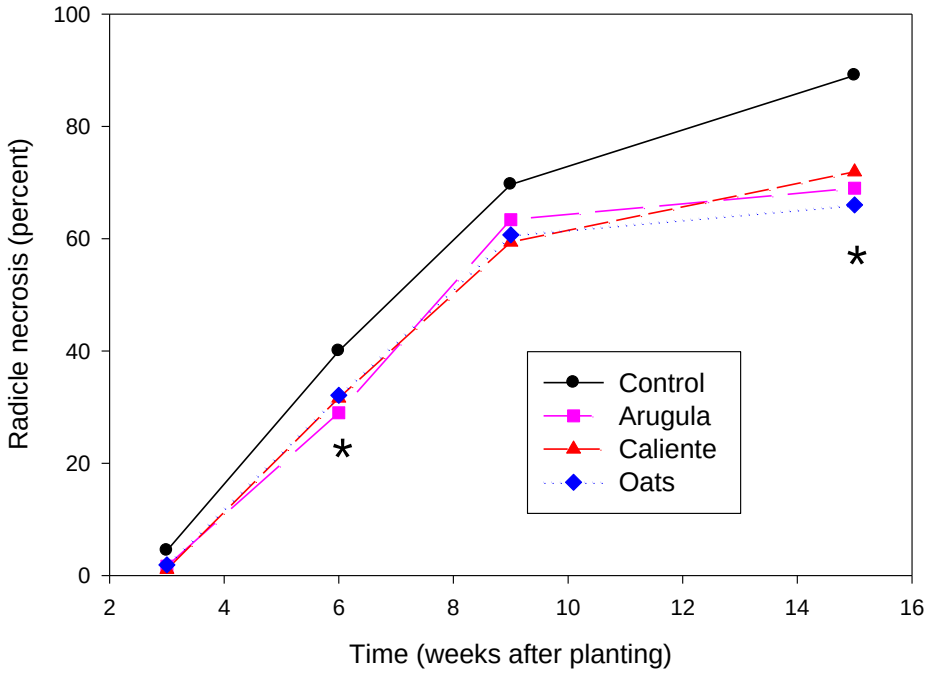

Fig. 6a. Radicle rot severity over time in Kenagy winter cover crop on-farm trial.

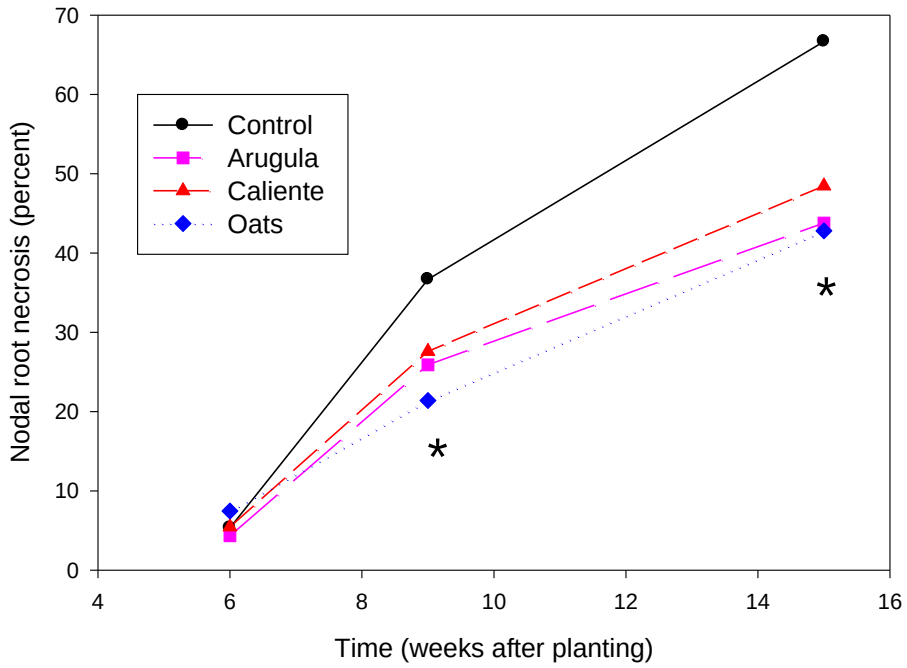

Fig. 6b. Nodal root rot severity over time in Kenagy winter cover crop on-farm trial.

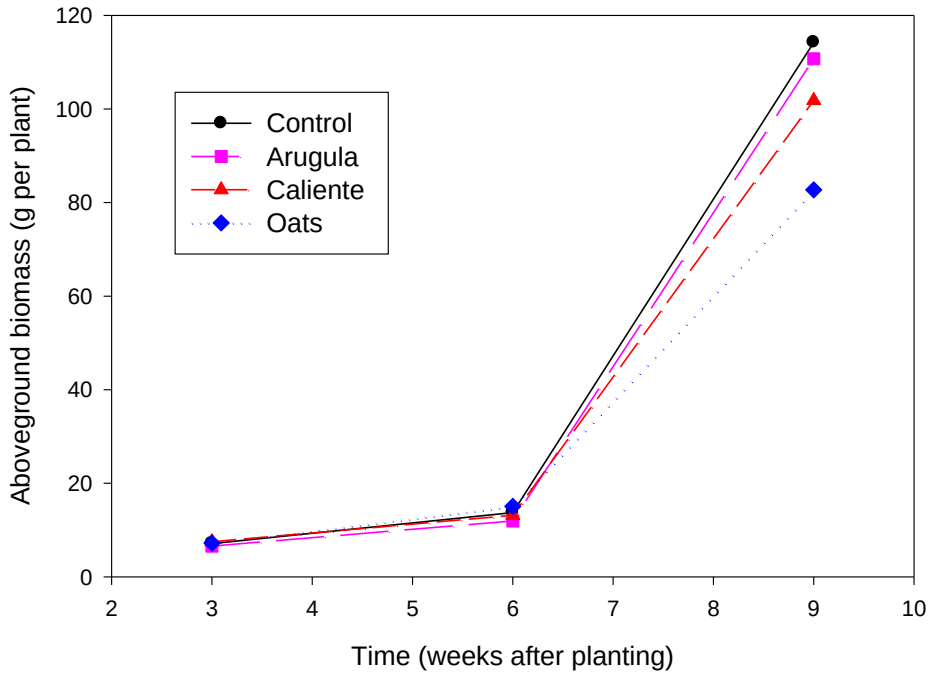

Fig. 7. Aboveground corn biomass in Kenagy winter cover crop on-farm trial.

Table 2. Kenagy Family Farm winter cover crop trial: yield

Treatment	Yield (g corn/15 plants)
Control (fallow)	5235
Mustard mix “Caliente”	5235
Arugula ”Nemfix”	4747
Oats “Saia”	4512
P=0.05	NS