Report to the Oregon Processed Vegetable Commission

TITLE: CULTURAL MANAGEMENT OF CORN ROOT ROT.
Report 2: Cover crops, compost teas, and calcium fertilizers.
(see also **Report 1: Rotbusters varietal survey and grower cropping history survey)**

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Funding received in 2004: $17,592

OBJECTIVES:
Overall objective: To develop cultural strategies to reduce the severity of corn root rot and improve corn yield.
Specific objectives in 2004:

1. Identify specific cover crops that suppress corn root rot and improve corn yield.
2. Screen compost teas and calcium fertilizers for effects on root rot severity and corn growth (this research objective was funded by a grant from the OSU Agricultural Research Foundation).
3. Investigate the relationship between soil physical properties, root rot severity and yield.

SUMMARY:
COVER CROP TRIALS:
Experiment station trial 2003-04:

- ✓ There was little difference in cover crop biomass amongst species. Rape "Dwarf Essex" biomass was significantly lower than that of 'Cadan 99B'/*Crotolaria.*
- ✓ In greenhouse bioassays conducted on soils collected two months after late summer cover crop incorporation, the 'Caliente', rape 'Dwarf Essex' and oat 'Saia' treatments all significantly increased corn aboveground biomass by approximately 28%. All cover crop treatments numerically increased corn biomass. Only rape 'Dwarf Essex' significantly increased root biomass (by 28%), although again, all cover crop treatments numerically increased root biomass.
- ✓ The fall-sown mustard mix 'Caliente' was completely winter-killed and the mustard 'Braco' was mostly winter-killed by the January ice storm.
- ✓ There was no significant difference in corn shoot biomass in the field-grown corn at the 6 leaf stage. However, the late summer mustard treatment 'Caliente' significantly increased marketable yield.
- ✓ Radicle rot severity was significantly lower in the oats and 'Cadan 99B'/oats treatments than in the control treatment (late summer cover crops), and nodal root rot severity was significantly lower in the oats treatment than in the control (winter cover crops) in field-grown corn at the 6 leaf stage. The mustard

treatments 'Braco' and 'Caliente' both suppressed nodal root rot severity relative to the control at harvest.

Conclusion: From these preliminary observations, we conclude that 'Caliente' has some potential to promote corn growth and yield. We have planted a replicated field trial with late summer and winter cover crops (including oats, 'Caliente', and 'Dwarf Essex') and are screening mustard species and mixtures for winter hardiness.

COMPOST TEA AND CALCIUM FERTILIZER TRIAL:

- ✓ Root rot severity was reduced relative to the control by a homemade aerobically produced compost tea with kelp and humates as additives (11-33% reduction in severity) and Vigor-Cal-Phos (18-57%) in two of three soils. Root rot severity was reduced by a non-aerated tea produced with kelp and humates (31%) and Vigor-Cal (29%) in one of three soils.
- ✓ All teas except the Subler extract improved above-ground biomass, stalk diameter, or height in some soils, particularly the OSU sandy loam and the Stayton cobbly loam. Much of this effect is likely due to the nutritive value of the compost teas, as the trial was under-fertilized.

Conclusion: The homemade teas with kelp and humates, the Vigor-Cal-Phos, and Vigor-Cal reduced root rot severity in container trials. These materials should be further evaluated under field conditions.

PHYSICAL PROPERTIES, ROOT ROT, AND YIELD PROJECT:

- ✓ The "Visual Soil Assessment" technique was not useful for evaluating soil physical quality in the corn fields tested.
- ✓ We cooperated with Ed Peachey in a compaction study that was integrated into his irrigation management research; the compaction data from that work is presented in Ed Peachey's irrigation management report.

INTRODUCTION:

Improving soil quality through cover cropping or organic amendment can improve germination, plant growth, and yield as well as improve root health. We have shown that increasing microbial activity through soil amendment with organic wastes suppresses root rot of corn and bean. These same effects should also be generated by high biomass cover cropping. We have shown in container trials that cover cropping can increase root and shoot biomass of corn. In an on-farm unreplicated trial at Kenagy Family Farm in 2002-03, we observed dramatic growth enhancement in field grown corn grown after the incorporation of an overwintered mustard mixture 'Caliente'. Corn grown in the same 'Caliente' treated soils in greenhouse bioassays were also much larger in aboveground biomass than corn grown in control soils.

Another means of increasing microbial activity and populations of beneficial microbes is by drenching soil with compost tea. Some commercial vegetable growers have applyied compost tea through irrigation systems to increase soil microbial activity. These producers expend little time or resources applying material and have reported increased root development, reduced fertility inputs, and higher yields (Schmitz, 2002). Compost tea can be produced by extracting microorganisms and soluble nutrients from compost in water, then multiplying the beneficial organisms in a 24 hour brewing step

(Scheuerell and Mahaffee, 2002). The resulting liquid is proportioned into irrigation systems and applied to crops in the same manner as conventional fertilizers.

Poor soil physical properties exacerbate a wide variety of root diseases (Allmaras et al, 1988). Soil compaction was the factor most strongly related to black root rot of strawberry in a New York survey of cultural and physical factors associated with this syndrome. Similarly, compaction is a strong determinant of *Aphanomyces* root rot of pea, root rots and wilt of chickpea, and root rot of white bean. Improvements in soil physical properties typically enhance root growth and health (reviewed by Allmaras et al, 1988; Russell, 1975). Poorly aerated or physically constrained soils reduce the rate of root growth by up to 75%, induce the formation of lateral roots, and increase root exudation (Russell, 1975); all of these factors increase the likelihood that a root will become infected (Allmaras et al, 1988).

COVER CROP TRIAL:

Methods:

Overall design and treatments:

A field trial was established in August 2003 to evaluate the impact of late summer and winter cover crops on root rot and yield of corn. The trial was established on a field which has been in continuous corn for more than 10 years; it has high root rot potential and very few weed seeds. The summer cover crop treatments and seeding rates are described in Tables 1a and 1b. Winter cover crops included mustard "Braco", mustard mix 'Caliente', oats 'Saia', and an unamended control (4 treatments), seeded at the same rates as summer cover crops. Cover crops were sown in 15' x 20' plots replicated three times in a randomized complete block design, with summer and winter cover crops managed as separate experiments.

Table 1a: Cover crop treatments

1. *Sinapis alba* 'Braco'
2. *Brassica* spp. 'Caliente'
3. *Brassica napus* (rape) 'Dwarf Essex')
4. *Sorghum bicolor* var. *sudanense* 'Piper'
5. *Sorghum bicolor* X *Sorghum bicolor* var. *sudanense* (Sorghum-Sudangrass hybrid) 'Cadan 99B'
6. *Avena sativa* (Oats) 'Saia'
7. 'Caliente'/'Cadan 99B'
8. 'Caliente'/*Crotolaria juncea*
9. 'Caliente'/Oats
10. 'Cadan 99B'/Oats
11. 'Cadan 99B'/*Crotolaria*
12. Control

Table 1b: Cover Crop Seeding Rate

#	Cover crop	Seeding Rate
1	'Braco'	15 lb/A
2	'Caliente'	15 lb/A
3	Rape 'Dwarf Essex'	15 lb/A
4	'Piper'	40 lb/A
5	'Cadan 99B'	40 lb/A
6	Oats	110 lb/A
7	'Caliente'/ 'Cadan 99B'	7.5 lb/A Caliente + 7.5 lb/A Cadan 99B
8	'Caliente' / *Crotolaria*	7.5 lb/A Caliente + 30 lb/A Crotolaria
9	'Caliente' / Oats	7.5 lb/A Caliente + 55 lb/A Oats
10	'Cadan 99B'/ Oats	7.5 lb/A Cadan 99B + 55 lb/A Oats
11	'Cadan 99B'/ *Crotolaria*	7.5 lb/A Cadan 99 B + 30 lb/A Crotolaria

Cover crop management:

Summer cover crop treatments were sown August 12 and flailed and incorporated on October 25-26, 2003. Winter cover crops were sown on September 23 and were flailed and incorporated April 25, 2004. Just before flailing and incorporating, cover crops were sampled for aboveground biomass. Each plot was sampled at two randomly chosen locations (50.8 cm by 50.8 cm subsamples). Subsamples were dried at 38°C.

Sweet corn management and root rot evaluation:

Sweet corn 'Reward' (root rot intolerant) was planted May 18, 2004. At the 6 leaf stage, 10 corn plants per plot were harvested and dried for aboveground biomass. The roots were washed and radicle and nodal root rot severity were evaluated on a 0 to 8 scale (0 = healthy, 1 = 1- 10%, 2 = 11 to 20 %, 3 = 21 to 40%, 4 = 41 to 60%, 5 = 61 to 80%, 6 = 81 to 90%, 7 = 91 to 99%, and 8 = 100% necrosis). Corn was harvested on August 8, 2004. All corn ears were removed from one 10 foot section of one row per plot and weighed as is (gross yield). For marketable yield, all corn was husked, and ears with less than 6 inches of fully formed kernels were discarded and the remaining ears were weighed. Nodal necrosis was measured again at harvest using the same procedures as used at the 6 leaf stage.

Greenhouse bioassays:

Baseline soil sampling: Three adjacent plots (20' x 15' each) were sampled as a unit (60' x 15'). Eight soil wedges were taken from each 60' x 15' area. Each soil wedge (approximately 13 cm x 5 cm x 15 cm) was sampled with an AMS Soil Sampling Sharpshooter Shovel (AMS Inc., American Falls, ID). The sampled soils were air-dried and the soil wedges were passed through a 2.54 cm screen and mixed thoroughly.
Second soil sampling: The second soil sampling was conducted on January 19, 2004, approximately two months after cover crop incorporation. Each plot was sampled individually; subsamples were taken at 8 different locations within each 20 ft by 15 ft plot. Soil samples were handled as described above.

The first bioassay (baseline) was started August 11 and harvested September 29, 2003. The second bioassay was started February 10 and harvested April 11, 2004. Thoroughly mixed soil samples from each plot were placed into 8 (550 ml) cone tubes. Sweet corn seeds ('Golden Jubilee'), treated with Captan, were treated with 10 % sodium hypochlorite solution for 5 minutes and rinsed thoroughly with diH_2O before planting into the cone tubes. Two sweet corn seeds were planted in each cone tube at a depth of about 2.5 cm. When the seedlings emerged they were thinned to one corn plant per container. Cone tubes were irrigated daily to maintain soil moisture near field capacity and fertigated with 20-20-20 every week.

When the corn plants reached the 6 leaf stage the plants were removed from the cone tubes and their roots were evaluated. For the baseline trial, the radicle disease rating was based on a 0 to 4 scale (0 = healthy, 1 = 1-10% of radicle necrotic, 2 = 11-50 %, 3 = 51 to 99%, and 4 = 100%). Nodal roots were rated on an 11 point scale: (0, 0.1-1, 1.1-5, 6-10, 11-25, 26-50, 51-75, 76-90, 91-95, 96-99, 100% nodal root necrosis). The radicle and nodal roots harvested from the second bioassay were both evaluated on a 0 to 8 scale (0 = healthy, 1 = 1- 10% necrosis, 2 = 11 to 20%, 3 = 21 to 40%, 4 =

41 to 60%, 5 = 61 to 80%, 6 = 81 to 90%, 7 = 91 to 99%, and 8 = 100% necrosis). Above- and below-ground biomass were quantified in the second bioassay. Biomass samples were air-dried at Hyslop farm at 38 °C.

Results:

Experiment station field trial:

Cover crop biomass:

There was little difference in cover crop biomass from treatment to treatment. Rape 'Dwarf Essex' biomass was significantly lower than the biomass of the mixture 'Cadan 99B'/*Crotolaria* (Table 3). The fall-planted mustard mix 'Caliente' was completely killed by the January 2004 ice storm; the mustard 'Braco' was severely damaged but some re-growth occurred.

Greenhouse bioassays:

In greenhouse bioassays conducted on soils collected two months after late summer cover crop incorporation, the 'Caliente', rape 'Dwarf Essex' and 'Caliente'/oats treatments significantly increased corn aboveground biomass by approximately 28% (Table 3). All cover crop treatments numerically increased corn biomass (Table 3). Only rape 'Dwarf Essex' significantly increased root biomass (by 28%), although again, all cover crop treatments numerically increased root biomass (Table 3).
Root rot potential was fairly even across the plots before treatments were applied as determined by the baseline greenhouse bioassay (data not shown). All cover crop treatments numerically reduced radicle rot severity relative to the control treatment, but only 'Cadan 99B'/*Crotolaria* significantly reduced radicle rot severity. All cover crop treatments except rape 'Dwarf Essex' numerically reduced nodal root rot severity relative to the control, and 'Cadan 99B'/*Crotolaria*, oats, 'Caliente'/Oats, and 'Caliente'/'Cadan 99B' significantly reduced nodal root rot severity (Table 4).

Table 2. Cover crop biomass, late summer cover crops.

Cover crop	Biomass (dry T/A)
9. 'Caliente'/Oats	2.81 ab[1]
6. Oats 'Saia'	2.25 ab
7. 'Caliente'/'Cadan 99B'	2.93 ab
11. 'Cadan 99B'/*Crotolaria*	3.30 b
10. 'Cadan 99B'/Oats	2.35 ab
1. 'Braco'	2.87 ab
3. 'Dwarf Essex'	1.87 a
8. 'Caliente'/*Crotolaria*	2.94 ab
5. 'Cadan 99B'	3.06 ab
4. 'Piper'	3.03 ab
2. 'Caliente'	2.66 ab

[1] Means followed by the same letter are not significantly different. *P*=0.05

Table 3. Corn shoot and root biomass, greenhouse bioassay

Varieties	Shoot biomass (g)	Root biomass (g)
'Caliente'	5.63 b[1]	1.20 ab
Rape 'Dwarf Essex'	5.59 b	1.30 b
'Caliente'/Oats	5.55 b	1.24 ab
Oats 'Saia'	5.35 ab	1.09 ab
'Caliente'/'Cadan 99B'	5.29 ab	1.17 ab
'Braco'	5.12 ab	1.16 ab
'Caliente'/*Crotolaria*	5.09 ab	1.03 a
'Cadan 99B'	5.04 ab	1.17 ab
'Cadan 99B'/Oats	5.02 ab	1.19 ab
'Piper'	4.96 ab	1.14 ab
'Cadan 99B'/*Crotolaria*	4.95 ab	1.06 a
Control	4.36 a	1.01 a

[1]Means followed by the same letter are not significantly different. $P = 0.05$

Field-grown corn:

There was no significant difference in corn shoot biomass in the field-grown corn at the 6 leaf stage (Table 5). However, radicle rot severity was significantly lower in the oats and 'Cadan 99B'/oats treatments than in the control treatment in the late summer cover crops, and nodal root rot severity was significantly lower in the oats treatment than in the control in the winter cover crop trial at the 6 leaf stage (Table 5). The mustard treatments 'Braco' and 'Caliente' both suppressed nodal root rot severity relative to the control at harvest (Table 6). The late summer mustard treatment 'Caliente' significantly increased marketable yield and had the numerically highest gross yield (Table 6).

Table 4. Root necrosis, greenhouse bioassay.

Treatments (summers only)	Radicle necrosis (%)	Nodal necrosis (%)
12. Control	97.7 b	22.7 cd
3. 'Dwarf Essex'	96.5 b	23.1 d
4. 'Piper'	96.5 b	18.3 abcd
2. 'Caliente'	93.2 b	18.1 abcd
1. 'Braco'	90.4 b	21.7 bcd
5. 'Cadan 99B'	89.1 ab	19.4 abcd
9. 'Caliente'/Oats	87.7 ab	13.3 ab
8. 'Caliente'/*Crotolaria*	87.0 ab	14.6 abc
6. Oats 'Saia'	86.2 ab	14.0 ab
10. 'Cadan 99B'/Oats	84.5 ab	19.4
7. 'Caliente'/'Cadan 99B'	82.7 ab	11.9 a
11. 'Cadan 99B'/*Crotolaria*	75.0 a	14.2 ab
	P=0.05	P=0.05

Table 5. Shoot biomass and root necrosis at the 6 leaf stage, field-grown corn

Treatment	Aboveground biomass (g)	Radicle necrosis (%)	Nodal necrosis(%)
Winters:			
1. Mustard 'Braco'	350.1	91.5	22.5 b
6. Oats 'Saia'	340.8	95.7	11.0 a
12. Control	329.6	90.8	20.2 b
	NS, *P*=0.05	NS, *P*=0.05	*P*=0.10
Late summers:			
1. Mustard 'Braco'	415.7	93.7 a	20.5
2. Mustard 'Caliente'	548.3	94.5 a	19.8
3. Rape 'Dwarf Essex'	367.7	93.8 a	11.5
5. 'Cadan 99B'	392.0	87.0 ab	15.5
6. Oats 'Saia'	538.7	82.3 b	16.0
7. 'Caliente'/'Cadan 99B'	492.0	88.7 ab	18.8
9. 'Caliente'/Oats	507.0	85.9 ab	16.2
10. 'Cadan 99B'/Oats	470.7	81.1 b	17.2
12. Control	527.0	92.2 a	18.3
	NS, *P*=0.05	*P* = 0.05	NS, *P*=0.05

Table 6. Root necrosis and yield at harvest, field-grown corn

Treatment	Nodal necrosis (%)	Gross yield (g)	Marketable yield (g)
Winters:			
1. Mustard 'Braco'	49.9	5145	4908
6. Oats 'Saia'	46.8	4657	4208
12. Control	43.1	5632	5395
	NS, *P*=0.05	NS, *P*=0.05	NS, *P*=0.05
Late summers:			
2. Mustard 'Caliente'	46.7 a	5583	5340 b
10. 'Cadan 99B'/Oats	60.0 b	5528	5140 ab
9. 'Caliente'/Oats	55.2 ab	5307	4977 ab
3. Rape 'Dwarf Essex'	60.4 b	5070	4737 ab
7. 'Caliente'/'Cadan 99B'	53.3 ab	4883	4455 a
12. Control	61.3 b	4750	4375 a
1. Mustard 'Braco'	43.0 a	4862	4323 a
6. Oats 'Saia'	56.0 ab	4777	4318 a
5. 'Cadan 99B'	49.3 ab	4803	4308 a
	P = 0.05	NS, *P*=0.05	*P* = 0.05

Conclusion:
We have observed growth promotion in greenhouse bioassays when corn was planted within 2 months of 'Caliente' incorporation. We have only observed growth promotion in the field (in a pseudo-replicated trial) from fall-planted overwintered 'Caliente' in 02-03 (as 'Caliente' did not survive the winter of 03-04 in our replicated trial), but we have observed a yield increase in corn grown after a late summer 'Caliente' cover crop. From these preliminary observations, we conclude that 'Caliente' has some potential to promote corn growth and yield. We have a replicated field trial with late summer and winter cover crops (including oats and mustards 'Caliente' and 'Dwarf Essex') and are now screening mustard species and mixtures for winter hardiness.

COMPOST TEA AND CALCIUM FERTILIZER TRIAL:
Methods:
This outdoor container experiment consisted of a total of 36 treatments (12 tea and calcium treatments, each applied to three different soils), with four replications, arranged in a complete randomized design. Treatments were applied to three Willamette Valley field soils with known high root rot potential:

1) a sandy loam from the OSU vegetable research farm (OSU sandy loam)
2) a Chehalis silt loam from Kenagy Family Farm in Albany, OR (Kenagy Chehalis silt loam)
3) a cobbly loam from Stayton, OR (Stayton cobbly loam)

Soils were screened through a 2.54 cm mesh sieve and placed into 11 L plastic containers filled previously to 6 cm with gravel. The containers were grown under light shade outside at the OSU Vegetable Research Farm. Six seeds of sweet corn "Golden Jubilee" were planted 2.54 cm deep in each container on July 30. Plants were thinned to 3 per container at two weeks after planting. Plants were fertigated twice (9/1 and 9/8) with 20-20-20 fertilizer.
All treatments were applied weekly for 6 weeks, beginning two weeks before planting (6 treatments in all). All tea treatments as well as Vigor-Cal and Vigor-Cal-Phos treatments were applied at 0.6 L of solution per container. Gypsum, dolomite, and hydrated lime treatments were thoroughly mixed into soil before soil was added to the containers. Solid calcium treatments were applied at a rate calculated to supply 600 lbs Ca per acre.
After harvest, above-ground biomass, stalk diameter at approximately six inches, and height from soil surface to extended leaf tips were determined. Roots were washed and evaluated for radicle and nodal root rot. Data reported for each container represents the average of the three plants in each container.

<u>Treatments</u>
1. Control: no treatment

Compost tea

2. Water control (Water): Water only, applied at same application rate as teas.
3. Aerated Compost Tea (AerTea): mixed in 5 gallon buckets using a Soil Soup aerator with stabilized farm compost (Gathering Together Farm), Humax, and Maxicrop. Brewed for 7 days.

4. Non-Aerated Compost Tea (NonAerTea): Same ingredients and brewing period as Aerated Compost Tea but not aerated.
5. Soilsmith Compost Tea (SoilsmithTea): Produced by a compost tea supply business (Soilsmith Services, Philomath, Oregon) using a 500-gallon Earth Tea Brewer (EPM, Inc., Cottage Grove, Oregon). Brewed for 24 hours.
6. Dr. Subler's Living Soil (Subler Tea): Commercial stabilized compost tea (water extracts of earthworm castings, Dr. Subler's Living Soil, Millheim, PA).
7. Aerated Compost Tea with Vigor Cal (VigCal + AerTea): Aerated Compost Tea with 0.8 mL of Vigor-Cal

Calcium

8. Dolomite (DolLime): 600 pounds Ca per acre
9. Gypsum (Gypsum): 600 pounds Ca per acre
10. Hydrated Lime (HydLime): 600 pounds Ca per acre
11. Vigor-Cal (VigCal): Soluble calcium (mined calcium carbonate; Agro-K, Minneapolis, Minnesota) at recommended application rate of 0.4 quarts Ca per acre
12. Vigor-Cal-Phos (VigCalPhos): Soluble calcium (calcium phosphite and copper sulfate; Agro-K, Minneapolis, Minnesota) at recommended application rate of 0.4 quarts Ca per acre

Results:

Root rot severity was reduced relative to the control by AerTea (11-33% reduction in severity) and Vigor-Cal-Phos (18-57%) in two of the three soils and by NonAer Tea (31%) and Vigor-Cal (29%) in one of the three soils (Tables 7 and 8 a-c). However, all teas except the Subler extract improved above-ground biomass, stalk diameter, or height in some soils, particularly the OSU sandy loam and the Stayton cobbly loam (Tables 7 and 8 a-c). Much of this effect is likely due to the nutritive value of the compost teas, as the trial was under-fertilized.

Conclusions: The homemade teas with kelp and humates, the Vigor-Cal-Phos, and Vigor-Cal reduced corn root rot severity in container trials. These materials should be further evaluated under field conditions.

Table 7. Significant treatment effects (P=0.05) on **radicle rot (R), nodal rot (N)**, above-ground biomass (B), stalk diameter (D), and plant height (H).

	Soil		
Treatment	Kenagy	OSU	Stayton
3. Aer Tea	B	B,D,**R**	B,D,**R**
4. NonAer Tea	B	B,D,H	B,D,**R**
5. Soilsmith Tea		B,H	B,D
7. VigorCal + Aer Tea	B	B,D,H	B,D
8. DolLime		B,D	
11. VigCal			**R**
12. VigCalPhos	**N**	**R,N**	

Table 8a. Compost tea/calcium fertilizers: OSU sandy loam

	Treatment	Biomass (g)	Radical necrosis (%)	Nodal necrosis (%)	Stem diam (cm)	Height (cm)
1	Control	9.8	95.8	30.8	10.7	101.4
2	Water	7.4	97.9	29.2	9.3	92.3
3	AerTea	**17.2**[1]	**85.0**	26.7	**14.9**	103.2
4	NonAerTea	**17.3**	96.3	42.1	**14.1**	**117.1**
5	Soilsmith Tea	**13.9**	94.2	26.3	11.8	**107.0**
6	Subler Tea	8.1	97.9	28.8	9.1	96.7
7	VigCal+AerTea	**16.5**	95.4	35.4	**13.4**	**111.5**
8	DolLime	**14.9**	93.8	27.5	**13.4**	102.0
9	Gypsum	12.6	87.9	25.4	12.2	101.9
10	HydLime	10.3	98.1	27.9	11.9	92.1
11	VigCal	9.6	95.8	23.8	10.8	91.8
12	VigCalPhos	9.3	**77.9**	**13.3**	9.8	95.6

[1]Bolded numbers represent values significantly different from the control (P=0.05)

Table 8b. Compost tea/calcium fertilizers: Kenagy Chehalis silt loam

	Treatment	Biomass (g)	Radical necrosis (%)	Nodal necrosis (%)	Stem diam (cm)	Height (cm)
1	Control	20.3	97.1	45.0	14.5	115.0
2	Water	15.9	98.9	35.0	14.7	103.5
3	AerTea	**24.2**[1]	95.8	41.7	14.7	120.0
4	NonAerTea	**22.2**	95.4	41.7	17.0	111.0
5	Soilsmith Tea	18.9	91.9	35.0	16.5	107.0
6	Subler Tea	19.4	100.0	40.0	15.5	112.6
7	VigCal+AerTea	**22.3**	97.3	30.4	17.0	106.7
8	DolLime	15.4	99.2	46.7	13.8	107.3
9	Gypsum	16.9	93.3	50.0	16.0	107.2
10	HydLime	21.7	99.6	43.3	16.4	118.4
11	VigCal	17.4	100.0	40.0	14.4	120.1
12	VigCalPhos	18.3	99.4	**28.8**	14.8	119.8

[1]Bolded numbers represent values significantly different from the control (P=0.05)

Table 8c. Compost tea/calcium fertilizers: Stayton cobbly loam

	Treatment	Biomass (g)	Radicle necrosis (%)	Nodal necrosis (%)	Stem diam (cm)	Height (cm)
1	Control	13.5	90.4	22.5	13.1	102.2
2	Water	12.1	87.9	19.2	12.3	98.7
3	AerTea	**18.9**[1]	**60.4**	9.2	**17.2**	103.3
4	NonAerTea	**21.1**	**62.1**	25.0	**16.4**	107.3
5	Soilsmith Tea	**18.8**	75.4	21.3	**15.0**	107.5
6	Subler Tea	12.6	83.3	26.3	12.9	98.1
7	VigCal+AerTea	**17.8**	75.4	19.6	**15.4**	100.5
8	DolLime	13.0	83.8	26.3	12.4	98.6
9	Gypsum	13.3	86.3	12.1	12.9	105.8
10	HydLime	13.9	77.9	25.0	13.7	96.8
11	VigCal	12.3	**64.2**	15.4	13.8	100.3
12	VigCalPhos	12.7	89.2	25.0	13.5	100.0

[1]Bolded numbers represent values significantly different from the control (P=0.05)

3. SOIL PHYSICAL PROPERTIES, ROOT ROT, AND YIELD PROJECT

Methods:

We used the "Visual Soil Assessment" method (Shepherd, 2000) to assess soil physical quality for 2004 Rotbusters corn fields. In brief, a 20 cm cube of topsoil was dug with a spade in corn fields at the 6 leaf stage. This cube was dropped from waist height (one to three times) onto a piece of wood set in a plastic basin lying on the ground. Clods from the drop test were then transferred onto a large plastic bag and sorted by size from most coarse to most fine. The visual soil test score card was used to evaluate the soil's physical properties. Indicators include soil structure/consistence, soil porosity, soil color, number and color of mottles, earthworm counts, tillage pan, and degree of clod development (Shepherd, 2000).

Results: We could not make the "VSA" method work. We applied the technique to soils that we considered to be of widely divergent physical quality but the technique could not differentiate the quality of the soils. As a result, we did not continue to pursue this project. However, we did cooperate with Ed Peachey in a compaction study that was integrated into his irrigation studies, and the compaction data from that work is presented in Ed Peachey's irrigation management report.

References:

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