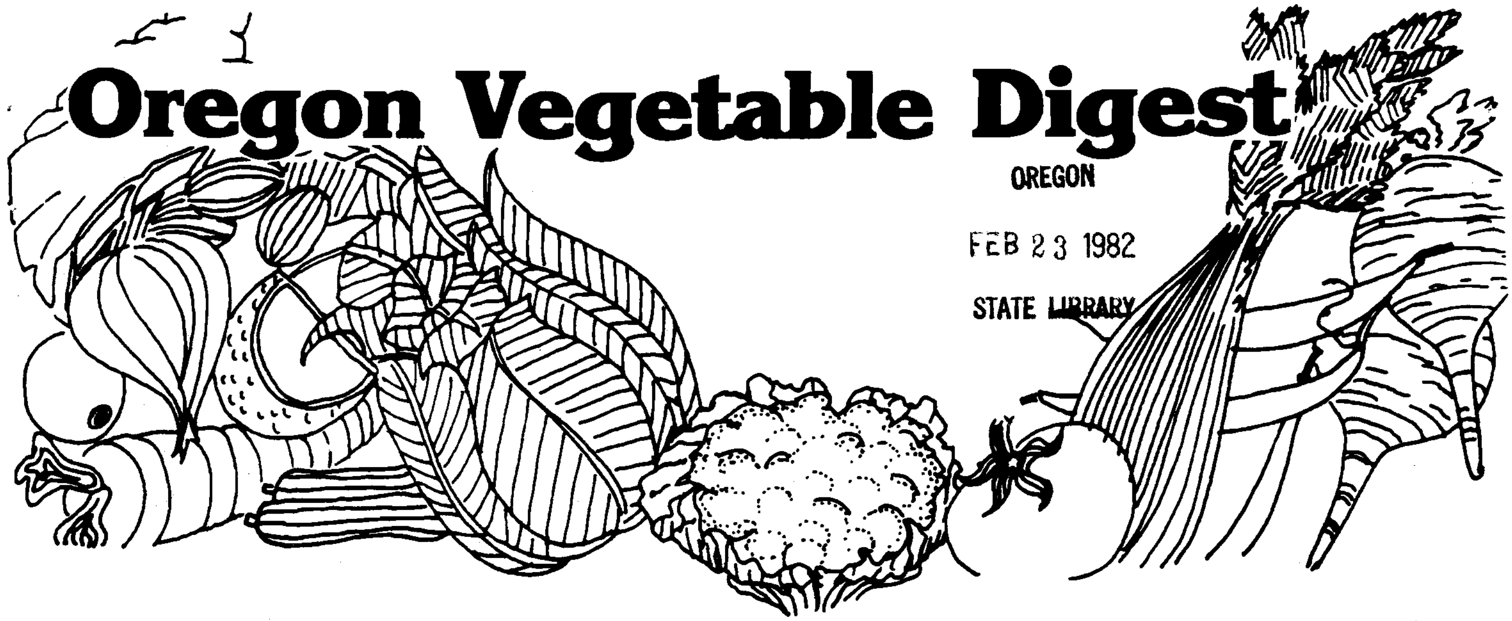
Oregon Vegetable Digest



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Improving Emergence and Uniformity of Lettuce in Warm Soils

Achieving an adequate seedling stand is often a problem with lettuce and other small-seeded vegetable crops. Erratic emergence and even stand failure may be caused by inadequate or excessive soil moisture or soil crusting. In lettuce crops seeded in warm weather, an additional cause of stand problems is thermodormancy, the failure of lettuce seed to germinate at soil temperatures above 80°F. Since the temperature at planting depth in Northwest soils often exceeds 90°F in July and August, thermodormancy may be the primary cause of delayed lettuce germination at this time.

Stand establishment of lettuce has been improved by use of anticrustants, fluid drilling of germinated seeds, or by transplanting. Some growers have obtained good stands of lettuce during warm weather by seeding and irrigating at night, so the seed imbibes cool water and is not subject to thermodormancy. Each of these methods involves increased cost and effort for the grower. The objective of the trials reported here was to explore some simple methods for improving stands and reducing harvest variability of crisphead lettuce sown in warm soils.

In 1979, seeds of 'Ithaca' lettuce were soaked in aerated tapwater at 63°F for 14 hours, air-dried for two hours, and seeded on July 16. Untreated dry seeds and pelleted (Moran-Coat) seeds also were planted at the same rate. In addition, the gel Viterra II, often used for fluid drilling of germinated seed, was applied to some furrows containing the soaked seeds. All furrows were then

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covered to 0.5-inch depth. Four weeks after seeding, stands were thinned to nine-inch in-row spacing and greenhouse-grown plants of similar maturity were transplanted.

Soil temperature at planting depth reached 97° on the planting date and the maximum soil temperature exceeded 88° for each of the 12 days following seeding. Only 19 percent of the untreated seed and 13 percent of the pelleted seed emerged, compared to 41 percent for the soaked seed and 64 percent for soaked seed covered with gel (Table 1). Soaking in cool water apparently overcame thermodormancy. The additional effect of the gel may have been caused by an anticrustant effect or to maintenance of favorable moisture conditions around the seed. Measurements of the force required to penetrate the soil crust indicated that less force was required over gel-treated rows.

Greatest yields and largest heads in 1979 were obtained with transplants, followed by soaked seeds in gel, and without gel (Table 1). Yields from untreated and pelleted seed were less than a third of transplant yield, caused by a combination of inadequate stand and delayed maturity. Each head was weighed individually at harvest and the degree of variability in weight among heads was expressed as the coefficient of variation (C.V.). Treatments which produced earlier and more uniform stands also produced less variability in head weight (lower percent C.V., Table 1).

A second trial was seeded on July 21, 1980. Treatments were as in 1979 except that the pelleted seed was replaced by dry seed plus gel. Plots were split and the subplots were harvested six days apart. The soil temperature maximum reached 93°F on the planting date but dropped to 88° the next day and averaged 3° cooler for the first 12 days after planting than in 1979. Perhaps because of this reduced stress, emergence of untreated seed was more rapid in 1980 than in 1979, however, all soak or gel treatments again increased emergence (Table 2).

Soaking in cool water may have again prevented thermodormancy, or soaking may simply have hastened the metabolic processes involved in germination. The emergence stimulating effect of the gel was larger than the soaking effect.

After thinning, all plots had essentially the desired stand. However, yields of transplants or with either gel treatment still exceeded the yields with dry or soaked seed (Table 2). Head weight variability was again least with transplants and greatest with untreated seed at the first harvest. At the second harvest, yields increased slightly and head weight variability decreased for all treatments. Variability was essentially equal for transplants and soaked seed planted with gel, reflecting the uniform emergence with the latter treatment. Simply soaking seed before planting caused significant improvements in yield and reduced variability but not to the same degree as transplanting.

Any of these methods is simpler and less costly than fluid drilling of germinated seed or using seed soaked in solutions of low osmotic potential. Seeds can be soaked less than 24 hours before needed, but cannot be stored. However, summer periods of high soil temperatures tend to last for many days and rainfall is unlikely to interfere with planting. Thus, a decision to soak seed for planting the next day involves little risk and may offer a reasonable alternative to other methods for establishing summer-seeded lettuce.

Table 1. Emergence 12 days after seeding, percentage of desired stand obtained after thinning on day 27, yield, and head weight of 'Ithaca' lettuce, 1979

Seed treatment	Stand (%) 12 days	Stand (%) 27 days	Total yield (tons/acre)	Mean head wt. (lb)	C.V. (%)
None	19c[z]	48b	8.0d	1.42b	23
Pelleted	13c	39c	6.7d	1.23b	26
Soaked	41b	97a	16.0c	1.35b	16
Soaked & gel	64a	100a	21.3b	1.74a	14
Transplant	-	100a	24.4a	1.91a	8

[z]Mean separation within columns by Duncan's multiple range test, 5% level.

Table 2. Emergence 13 days after seeding, percentage of desired stand obtained after thinning on day 27, yield, and head weight of 'Ithaca' lettuce, 1980

Seed treatment	Stand (%) 13 days	Stand (%) 27 days	First harvest Total yield (tons/acre)	First harvest Mean head wt.(lb)	First harvest C.V. (%)	Second harvest Total yield (tons/acre)	Second harvest Mean head wt.(lb)	Second harvest C.V. (%)
None	40d	97a	16.0c	1.26d	24	18.2c	1.39c	16
Gel	66b	100a	19.6a	1.58ab	14	20.9b	1.61b	11
Soaked	55c	100a	17.8b	1.37cd	16	20.4b	1.60b	11
Soaked & gel	81a	100a	19.6a	1.50bc	12	22.2a	1.73a	8
Transplant	-	100a	20.4a	1.64a	8	22.2a	1.75a	7

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Chemical Control of Corn Head Smut—1981

Seed treatments, in-furrow sprays, and in-furrow granular fungicides were tested for head smut control at the OSU Vegetable Research Farm. In-furrow spray applications in 26.8 gallons per acre at 30 per square inch and hand-spread granules were applied to the bottom of a 4-inch deep furrow in Chehalis silt loam (24 percent clay) which was closed after application. 'Jubilee' sweet corn was seeded on top of the closed furrow at a depth of 2 inches. The Baytan seed treatments and seed treatment of CGA-64250 were mixed 1 to 4 with water (vol to vol) and the diluted fungicide applied to the seed. The remaining products were mixed directly with the seed. Treatments were arranged in a randomized block design with five replications. Each replication consisted of a 20-foot row 3 feet from adjacent rows, with plants spaced at approximately 1 foot intervals. The plots received approximately 5 inches of overhead irrigation during the season. The plot contained soil-borne inoculum from variety tests that had been artificially inoculated three years before this experiment.

All treatments but GUS-215, CGA-88531 at 1 gram/kilogram, and the 8.9 fluid ounce rate of CGA-64250 gave statistically significant control of head smut. There was a tendency for CGA-64250 treatments to reduce stand. Two grams/kilogram of CGA-88531 and GUS-214B gave good control combined with high stand counts.

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Treatment, Rate and Application Method	No. of Plants/ 10 ft row	Percent Smut
Baytan 1.25 F 4.80 fl oz/cwt seed, seed treatment. . . .	18.2 abc*	5.90 ab**
Baytan 1.25 F 6.4 fl oz/cwt seed, seed treatment	20.4 ab	5.74 ab
Baytan 1.2 F 12.8 fl oz/cwt seed, seed treatment.	14.8 bcde	10.92 ab
CGA-64250 3.6 EC 17.8 fl oz/A, in-furrow spray.	15.8 abcde	5.30 ab
CGA-64250 3.6 EC 8.9 fl oz/A, in-furrow spray.	9.8 de	16.22 abc
CGA-64250 3.6 EC 4.4 fl oz/A, in-furrow spray.	13.2 bcde	11.50 ab
CGA-64250 2.5 G 20 lbs/A, in-furrow spray.	11.2 cde	2.50 a
CGA-64250 2.5 G 10 lbs/A, in-furrow spray.	9.0 c	3.34 a
CGA-64250 2.5 G 5 lbs/A, in-furrow spray	11.2 cde	2.36 a
CGA-64250 3.6 EC 1.1 fl oz/cwt seed, seed treatment. . .	12.2 cde	10.86 ab
GUS-214 B 1.25 F 6.4 fl oz/cwt seed, seed treatment. . .	22.8 a	10.40 ab
GUS-215 (Bas 389-01F) 4 fl oz/cwt seed, seed treatment .	14.6 bcde	18.72 bc
CGA-88531 1 g/kg seed, seed treatment.	16.8 abcd	12.34 abc
CGA-88531 2 g/kg seed, seed treatment.	18.6 abc	3.76 a
CGA-88531 4 g/kg seed, seed treatment.	12.0 cde	8.68 a
Untreated Control	16.8 abcd	31.44 c

*Values followed by the same letter are not significantly different from one another by Duncan's Multiple Range Test, P = 0.05.

**Values were converted to $X = \arcsin\sqrt{\text{percent}}$ for computation.

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Corn Head Smut Affected by Cultural Practices

Tests were continued in 1981 at the OSU Vegetable Research Farm to evaluate the effects of certain cultural practices on incidence of head smut (Spacelotheca realiana) of 'Jubilee' sweet corn. Plots were in an area infested during five years of earlier tests on variety evaluation for head smut resistance. It has been shown that early stages of germination and emergence are more critical for potential infection than later.

Two plantings were made with planting depth, seed size, and other treatments (replicated four times) varied as listed in Table 1. Standard seeding depth was two inches unless otherwise stated. The first planting was on May 29; the second was on June 23. No irrigation was applied during the first three weeks after planting, but was followed by minimal irrigation until harvest. Rainfall for this three-week period for the first planting was 2.6 inches, mostly during June 4 to 13, with more than an inch on June 8. Rainfall for the three-week period after planting was .1 inch for the second planting. One observation on number of plants infected with head smut was made on September 8 and on September 29 for the respective plantings. Data from the two plantings were combined for analysis.

There was a trend for increased number of infected plants at planting depths greater than one inch, ranging from 6.0 percent at the one-inch depth to 23.4 percent of plants infected for the four-inch depth of planting treatment (Table 1). It is not clear why at the one-half-inch planting depth more plants were infected than at one-inch depth, although this may have been related to drier soil conditions at the shallower depth. The three and four-inch depths may have delayed germination and emergence enough to allow increased infection.

In comparing seed sizes, large seed size had the least amount of plants infected; medium and small sizes produced about the same percentages of infected plants. Effects of seed size and planting depth followed the same pattern observed in 1980 tests which were reported in Oregon Vegetable Digest, Volume 29, October, 1980. Including lime in the furrow with seed at planting resulted in less infection than when no lime was included (treatments 9 and 3 compared). Highest percentage of infected plants was in the treatment in which vermiculite was in the furrow with seed at planting.

In another test on 'Jubilee' sweet corn planted on June 23, four irrigation treatments were established for the first three weeks after planting. These were zero, one, two, and four irrigation applications of about .75 inch of water per application. There were no significant differences in percentages of plants infected with head smut for the various treatments and these ranged from 19.7 percent in the non-irrigated treatment to 15.3 percent for the treatment that was irrigated four times during June 23 to July 15. Contrasted to these results, a test in 1980 showed that frequent irrigation after seeding substantially reduced head smut infection compared to a treatment that was not irrigated during the first three weeks after planting. Further work is planned on evaluation of effects of cultural practices on incidence of head smut on sweet corn.

Table 1. Effects of various cultural treatments on incidence of head smut of 'Jubilee' sweet corn, Corvallis, 1981

Treatment	Percent of Plants Infected
1) Seed planted 1/2-inch depth	17.2 bcd
2) Seed planted 1-inch depth	6.0 a
3) Seed planted 2-inch depth	16.2 bcd
4) Seed planted 3-inch depth	21.6 bcd
5) Seed planted 4-inch depth	23.4 cd
6) Small seed size	26.6 d
7) Medium seed size	24.0 d
8) Large seed size	12.5 abc
9) Lime in furrow with seed at planting	9.8 ab
10) Vermiculite in furrow with seed at planting	28.4 d

Values followed by the same letter are not significantly different from one another by Duncan's Multiple Range Test.

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North Willamette Station Vegetable Research Summary—1981

1. Overwintered Onions (N. S. Mansour, cooperator).

The performance of 27 cultivars was evaluated in a replicated trial seeded on September 30, 1980 and harvested on July 16, 1981. The plot area received a total of 200 pounds N/acre, 70 pounds applied before planting and the remainder applied in mid-January and mid-April. All plants were topped two weeks before harvest. Most cultivars exhibited significant bolting. Highest yielding cultivars were Sweet Winter 1909, Red Cross, Keep Well, Senshyu Yellow Globe, Willamette Sweet, and Imai. Particularly high quality cultivars in terms of color, lack of bolting and splits, and small neck size included Keep Well, Imai, Senshyu Yellow, and Red Cross. A three-month storage test of the seven cultivars with the best quality and yield indicated that Keep Well and OWY 100 (Dessert Seed Co.) had the longest storage life.

2. Overwintered Cauliflower and Cabbage (N. S. Mansour, cooperator).

The 1980-81 cauliflower trials included three variety trials and a planting window trial with the cultivar Armado April. The variety trials were seeded in a glasshouse on August 5, August 15, and August 22, 1980 and transplanted on September 11, September 17, and September 30, 1980, respectively. The planting window trial was seeded on July 25, August 2, and August 15, 1980, and transplanted on September 5, September 11, and September 17, 1980. Yield of Armado April declined at the later planting dates but maturity date was not affected. Winterkill was not a problem in 1980/81. Highest yielding cultivars in the variety trial were Armado May (9.2 T/A gross yield), Midsummer (8.0 T/A), Armado Clio (8.3 T/A), and Aprilex (7.8 T/A). Armado April, Maya, Maystar, and Vision also exceeded 7.0 T/A gross yield. Highest quality heads were obtained with Armado April, Armado May, Maya, and Armado Quick.

Several lines of cabbage were overwintered. However, adequate head size and quality were obtained only with conical-headed types.

3. Summer (Heat-Tolerant) Cauliflower Trial.

Thirty-seven lines or cultivars of cauliflower were seeded on April 10, 1981 and transplanted on May 18, 1981 on 3' x 1½' spacing. Heads were harvested at three-day intervals from July 6 to July 27. Highest gross yields were obtained with Alert, Snowcrown, Dok Elgon, Kibo Giant, and King (all over 7.0 T/A). Highest average quality heads were obtained from Dominant, Maveron, Self-blanche, Starlight, Dok Elgon, Delira, Snowball 16, and White Summer, each with at least 70 percent grade #1 heads. Earliest cultivars were Alert, King, MSU 817, Snowcrown, and White Empress. Temperatures during the harvest period were only slightly conducive to poor curd quality. Early varieties were subjected to higher temperatures during curd growth than were later varieties, and quality generally improved with the later varieties.

4. Brussels Sprouts Trials (N. S. Mansour, J. Parsons, cooperators).

Four trials of a dozen cultivars each were evaluated for several quality factors including sprout size, shape, color, and solidity, picking and deleafing ease, uniformity, and disease susceptibility. The first trial was transplanted on April 25, 1980 and harvested on August 12 and September 23, 1980. The second trial was transplanted on May 6, 1980 and harvested on November 14, 1980. The third trial was transplanted on May 29, 1980 and harvested on March 13, 1981. The fourth trial was transplanted on September 5, 1980. All cultivars in the fourth trial bolted in early spring of 1981 and were not harvested. Most promising cultivars in terms of yield potential and quality in the first trial were Jade Cross E, Lindo, and Argosy. Best cultivars in the second trial were Achilles, Horatius, and Jade Cross E. In the third trial, the cultivar Rasmunda excelled in resistance to disease and blasting of sprouts. The fourth planting went to seed in early spring without producing marketable sprouts.

5. In-field Forcing of Rhubarb with Gibberellic Acid (Jack Parsons, cooperator).

Gibberellic acid (GA) was injected directly into buds of rhubarb crowns on February 20. A total of 10 milliliter of 800 or 4000 parts per million GA was injected per crown, with the total divided among three or four buds. The GA treatment significantly increased average spear weight and length. Response was greatest near the injection point and untreated areas of the crown showed little response, indicating very little translocation of the GA. Quality of spears from treated crowns was adequate, comparing favorably with quality of spears forced with clear plastic mulch.

6. Solar Trenches and Pods for Extending the Growing Season.

"Solar trenches" consist of V-shaped furrows 12 inches deep and 18 inches wide at the soil surface. Sides of the trenches were lined with black plastic mulch and the top was covered with clear plastic mulch from time of seeding until early July. Air and soil temperatures are increased by several degrees, promoting early growth. Cucumber, tomato, zucchini, muskmelon, bell pepper, and sweet corn were seeded in the trenches and produced crops up to two weeks earlier than normal.

The solar pods consist of passively solar-heated cold frames covered with a double glazing of fiberglass. Cool season crops such as lettuce, spinach, Chinese cabbage, and radishes were grown in the pods throughout the winter of 1980-81. Yields and quality were acceptable, although light transmission through the covers is only 20 percent. In January, the average daily maximum air temperature was 3.3^{o}F higher inside the pods, the minimum air temperature averaged 2.5^{o} higher, and soil temperature averaged 11^{o} higher inside the pods.

7. Effect of Soil pH and N Fertilizers on Vegetable Stands.

Carrots and lettuce were seeded on plots with soil pH ranging from 4.9 to 6.5. Calcium nitrate, ammonium sulfate, and potassium nitrate were applied at 100 pounds N/acre and other plots received no fertilizer. In addition, the fertilizers were either broadcast on the soil surface, broadcast and then incorporated into the top 2 to 3 inches of soil, or half the fertilizer was broadcast and half banded 2 inches beneath and 2 inches to the side of the seed row. As in previous years, increasing soil pH from 5.0 to 6.0 increased seedling stands. All three fertilizers tended to reduce stands compared to unfertilized plots and stand reduction was most severe with calcium nitrate. Incorporating the fertilizer into the soil clearly prevented the stand reducing effects of the fertilizers.

8. Effect of Anticrustants on Vegetable Stands.

Carrots, lettuce, cucumbers, and onions were used to determine the effects on seedling stand and yield of the possible anticrustants phosphoric acid (PA), Nalco 2190, vermiculite, sulfuric acid (SA), and neutral ammonium phosphate solution (10-34-0). As in 1980, vermiculite over the seed row was the most effective treatment in reducing soil crusting, hastening seedling emergence, and increasing yields of carrots and lettuce. Nalco 2190 was the second most effective anticrustant, but PA usually produced better stands and yields. SA effectively reduced crusting but severely inhibited stands and yields of all crops except cucumber. The 10-34-0 solution reduced crusting slightly but had no effect on stands or yields of any crop. All treatments were cost competitive, ranging from \$20 to \$30/acre for materials.

9. Research in Progress.

Major trials of overwinter cauliflower are continuing at the Station and in cooperation with two processors. The experiments at the Station this winter include a major variety trial, a test of planting date effect on yield for early, mid-season, and late winter cauliflower varieties, and a mildew control experiment. Overwinter onion trials are continuing and a variety trial with overwinter spinach has been started. Another experiment is testing the effects of bulb size and planting density on yield, bulb size, and bulb shape of shallots.

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News and Notes

Seedbed Preparation for Carrot Production on Organic Soil

Five sets of basic tillage operations were carried out for five consecutive years on an organic soil, each followed by seeding on the flat or on raised beds to determine the cultural methods that would provide the best yield of quality fresh market carrots (*Daucus carota* L.) without adversely affecting the soil structure. Raised beds offered no yield advantage in a wet season and no yield reduction in a dry season. In a wet season, the bed system favored harvesting operations by reducing soil moisture and rendering the field surface firmer. Minimum tillage consisting of a fall and a spring disking did not reduce yields or increase soil bulk density as compared to spring plowing and rototilling. (J. A. Millette, B. Vigier, and E. J. Hogue. Journal of the American Society for Horticultural Science. 106(4):491-493. July 1981.)

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