

CRITICAL FACTORS FOR SUCCESSFUL SOIL FUMIGATION

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Soil fumigation for potatoes is justified only if it provides an economic gain for the grower.

Soil fumigation with TELONE[®] can provide economic control of the following problems for the potato farmer:

1. Nematodes
2. Verticillium wilt
3. Quack grass
4. Symphylan
5. Wireworm

When a grower has determined that he has a problem that may be corrected by soil fumigation, he should program his operation to obtain the maximum return for the dollar invested in soil fumigation.

Unfortunately, eradication of these problems cannot be obtained. Economic control, however, is readily within reach if we apply our collective knowledge to the problem.

Much of the effort of The Dow Chemical Company's research staff (both basic research and field research) has been and is being applied to the "how to" of soil fumigation to insure the maximum benefit.

I would like to pass on to you some of the fruit of our efforts. Please keep in mind that the basis for our recommendations includes extensive field and commercial experience.

CRITICAL FACTORS

- I. SOIL TILTH
- II. SOIL MOISTURE
- III. SURFACE SEAL
- IV. SOIL TEMPERATURE
- V. DOSAGE
- VI. ORGANIC MATTER

VII. INTERVAL FROM TIME OF
TREATMENT TO PLANTING

VIII. FALL OR SPRING TREATMENT

IX. METHOD OF APPLICATION

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I. SOIL TILTH

- A. Plow or chisel 12" or deeper
- B. Disc to seed bed condition
- C. Avoid shallow plow pan

II. SOIL MOISTURE

A. Definition

- 1. Saturated - no air space
- 2. Capacity - surface tension equals pull of gravity -
some air space
- 3. Wilting point - surface tension equals root suction -
maximum air space

B. Optimum condition - capacity at surface, wilting point
in sub-soil

C. Compromise - inject immediately after discing

III. SURFACE SEAL

- A. Necessary to reduce escape to atmosphere
- B. Cultipacker
- C. Ring roller
- D. Spike tooth harrow with tines flat
- E. Double beam float

IV. SOIL TEMPERATURE

- A. 40°F. to 80°F. at 6" - liquid to gas
- B. Higher temperature enhances distribution in soil and
decomposition of chemical

C. Activity as a soil fumigant excellent through complete range

V. DOSAGE - TELONE[®]

A. Label range - 12 gpa. to 48 gpa.

B. Depends on area and problem

1. Nematode control - Klamath Falls, Tulelake area -
spring application 20 gpa. to 25 gpa.

2. Verticillium wilt control - Klamath Falls area -
30 gpa. to 35 gpa. fall application

3. Washington and Idaho - Verticillium and nematode -
20 gpa.

4. Quack grass - Klamath Falls, Tulelake area - 20 gpa.

C. Dosage for particular problem in particular area -

Follow:

1. State recommendation

2. County recommendation

3. Commercial recommendation

4. Personal grower experience

VI. ORGANIC MATTER

A. Fumigant irreversibly absorbed into organic matter

B. Label indicates more than double amount required in
muck or peat soils as compared to mineral soils

C. Previous crop organic residue should be minimum

1. Plow down early - prior season desirable

2. Add nitrogen to organic plow down

3. Burn surface organic residue

4. Reinfection from undecomposed root knot nematode
galls

D. Escape chimneys for gas to be lost through soil surface

E. Trash problems on injection shanks

Straight shanks vs. forward swept shanks vs. swept back shanks

VII. INTERVAL FROM TIME OF TREATMENT TO PLANTING

Three weeks or more

1. 7 to 14 days undisturbed for gas distribution and fumigation effect to be maximized
2. Aeration - after undisturbed period, work soil by discing or plowing until fumigant odor not detectable

VIII. FALL OR SPRING TREATMENT

Fall vs. spring

1. Fall

a. Advantages

- 1) Soil temperature - high
- 2) Soil moisture - low
- 3) Interval from treatment to planting

b. Disadvantages

- 1) Time availability ?
- 2) Field determination
- 3) Previous crop residue

2. Spring

a. Advantages

- 1) Time availability ?
- 2) Field determination
- 3) Previous crop residue decomposed

b. Disadvantages

- 1) Soil temperature - low

2) Soil moisture - high

3) Interval from treatment to planting -
aeration vs. toxicity if soil stays cool and wet

IX. METHOD OF APPLICATION - INJECTION

- A. Shank spacing - 12" center to center or less
- B. Shank depth - 6" to 10" - 10" preferred
- C. Tubes on back of shanks - open bottoms - no pressure required to bottom of shank
- D. Gauge wheels for depth control - tool bar should rest on gauge wheels with hydraulic lift in float position.
- E. Metering system
 - 1. P. T. O. pump with pressure regulator and orifice system
 - a. Variables - pressure and speed
 - b. Low reliability for uniform application
 - c. Cost of metering system and plumbing - approximately \$200.00
 - 2. Ground driven metering pump
 - a. Flow dividing system - manifold vs. automatic divider - tubing length critical
 - b. Variables - calibration and slippage
 - c. Cost of metering system, plumbing, and drive system - approximately \$300.00 to \$400.00
 - 3. Constant head gravity unit
 - a. Variable - tractor speed
 - b. Absolutely constant metering per unit time
 - c. Cost of metering system and plumbing - approximately less than \$100.00
- F. Tool bars, gauge wheels, shanks and clamps, tank, tank mounting brackets - same for all units.

CONCLUSION

Soil fumigation can be a profitable investment for the grower.

We suggest that if a grower suspects he has a problem that can be solved with soil fumigation, he obtain the best local recommendation available to him, and treat a portion of his acreage to determine the best method and treatment for his problem in his area. It is vitally necessary that nontreated check areas be left so that comparative economics can be determined.

If a grower is going to fumigate his soil, we urge that he consider the critical factors:

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- VII. INTERVAL FROM TIME OF
TREATMENT TO PLANTING
- VIII. FALL OR SPRING TREATMENT
- IX. METHOD OF APPLICATION