

Dried Swine Lagoon Solids as a Fertilizer for Field Production of Vegetables and Fresh Cut Herbs

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Treatment and experimental design: Factorial treatment arrangement and randomized complete block design with six replications. The study was repeated twice: warm season (summer and fall of 2016) and cool season (August to December of 2016)

Treatments:

- Nutrient Sources:
 1. Anaerobically composted swine lagoon solids (SLS) (4N-2.6P-0.83K)
 2. Aerobically composted turkey litter (TL) (4N-2.6P-3.3K) (All Natural Landscapers' Choice, Sustane Natural Fertilizer, Inc., Cannon Falls, Minn.)
 3. Control: Calcium nitrate (15.5N-0P-0K) (YaraLiva Tropicote, Yara Belle Plaine Inc., Regina, Saskatchewan) and potassium chloride (0N-0P-49.8K) as the control fertilizers at a rate of 89.7 kg N, and 65.1 kg K per ha
- Nitrogen Rate:
 1. 100% rate: 89.7 kg N per ha
 2. 50% rate: 44.9 kg N per ha

Species grown (species were analyzed separately)

- Warm season species (lat. 35.03°N, long. 78.28°W):
 - *Cucumis melo* L. 'Athena F1' (cantaloupe)
 - *Solanum melongena* L. 'Traviata F1' (eggplant)
 - *Lycopersicon esculentum* Mill. 'Charger F1' (tomato)
 - *Ocimum basilicum* L. 'Dark Opal' (basil)
 - *Origanum vulgare* L. 'Hirtum' (oregano)
 - *Mentha spp.* L. (mint)
 - *Anethum graveolens* L. 'Hera' (dill)
- Cool season species (lat. 35.79°N, long. 78.70°W):
 - *Lactuca sativa* L. 'Vulcan' (red leaf lettuce)
 - *Brassica oleracea* L. 'Storage No. 4' (cabbage)
 - *Lactuca sativa* L. 'Adriana' (green butter head lettuce)
 - *Allium schoenoprasum* L. (chives)

- *Foeniculum vulgare* Mill. (fennel)

Soil types of two sites:

- Warm season: Lynchburg sandy loam (LSL)
- Cool season: Cecil gravelly sandy loam (CGSL)

Data collected for analysis:

- Soil total concentrations of phosphorus (P), potassium (K), calcium (Ca), sulfur (S), magnesium (Mg), zinc (Zn), copper (Cu), boron (B), iron (Fe), manganese (Mn), sodium (Na), nickel (Ni), cadmium (Cd), and lead (Pb)
 - Analyzed with and without the control fertilizer
 - See below for conversion from index value to quantitative equivalent.
- Growth and yield:
 - Tomato, cantaloupe, and eggplant were harvested upon reaching commercial maturity, counted, sorted into marketable and cull subgroups, and weighed within 1 h.
 - A final harvest of tomato, eggplant, cantaloupe, basil, mint, and oregano, regardless of maturity, was conducted on 8 August.
 - Fresh cuts of herbs, except dill, were collected when the plants had established commercial maturity, and were repeated every two weeks. The fresh cuts were also weighed on site within 1 h.
 - Dill was harvested one time, after flowering, at 54 d (11 July).
 - Cabbage was harvested when a full head had developed.
 - Red lettuce and green butterhead lettuce were harvested by cutting ~4 cm above ground level.
 - Chives and fennel were harvested by cutting ~2.5 cm above ground level when the crop had reached commercial maturity and were weighed within 1 h.

Data analysis

All variables were subjected to analysis of variance procedures (ANOVA) using general linear model (GLM) and Tukey's honest significant different means separation procedures where appropriate in SAS, Version 9.4 and were considered significant at $P \leq 0.05$. The effect of nutrient source, N rate, and their interaction were analyzed separately for each species. When nutrient source x N rate interaction was non-significant, main effects are presented.

Table 1.4 Multiplication factors for converting soil test index values to a quantitative equivalent*

Soil Test Index Value	mg/dm ³	kg/ha	lb/acre	meq/100 cm ³	meq/dm ³
P-I	1.2	2.40	2.138	N/A	N/A
K-I	1.955	3.91	3.484	0.005	0.05
Ca% × CEC	200.0	400.0	356.40	1.0	10.0
Mg% × CEC	121.6	243.2	216.69	1.0	10.0
Na	230.0	460.0	409.86	1.0	10.0
Mn-I	0.16	0.32	0.285	N/A	N/A
Zn-I	0.04	0.08	0.071	N/A	N/A
Cu-I	0.02	0.04	0.036	N/A	N/A
S-I	0.48	0.96	0.857	N/A	N/A

* Soil tests in North Carolina are made on a volume of soil. Conversion to an area equivalent is based on a depth of 20 cm (7.9 inches). To convert phosphorus and potassium from the elemental forms to lb/acre, use these multipliers: $2.29 \times P$ gives lb of P_2O_5 per acre; and $1.2 \times K$ gives lb of K_2O per acre.

The Volume Rationale: The area of a hectare (ha) is 10,000 m² or 1,000,000 dm². The volume per hectare to a depth of 20 cm or 2 dm equals 2,000,000 dm³. The following conversion factors apply: mg/dm³ = parts per million (ppm); mg/dm³ × 2 = kg/ha; kg/ha × 0.893 = lb/acre; or mg/dm³ × 1.78 = lb/acre. Refer to Part IV of this manual for other conversion factors.



Hardy DH, Tucker MR, Stokes CE. 2014. Crop fertilization based on North Carolina soil tests. Raleigh (NC): North Carolina Department of Agriculture and Consumer Services, Agronomic Division.

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