

Sewage Sludge Fertilization of Pinus eldarica Christmas Tree
Plantations

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Obtaining fast growing high quality Christmas trees is the objective of every grower. To accomplish this on the calcareous soils of the southwestern United States requires the addition of a soil ammendment. A good soil ammendment provides both added nutrients and improved soil condition. Sewage sludge is one alternative that the tree farmer has to help meet this criteria.

Sewage sludge is unique in comparison with conventional inorganic forms of fertilizer because it contains plant nutrients and it has beneficial soil building qualities. While not high in the macronutrients nitrogen, phosphorous or potassium, sewage sludge does contain these elements in

sufficient quantity to meet the plants' needs when adequate sludge is applied (McCaslin and O'Connor 1982). In addition to the macronutrients, sewage sludge also contains micronutrients, especially Fe and Zn. The addition of Fe to the calcareous soils improves both tree growth and quality by reducing chlorosis.

Many important physical properties of the soil are improved by the addition of sewage sludge. These include the following: improved soil water holding capacity, increased organic matter content (Mays et al. 1973), increase soil porosity and soil aggregate stability (Pagliai et al. 1981). These improved soil conditions lead to the following conditions; improved irrigation efficiency by increasing the water holding capacity, improved fertilization efficiency by increasing the cation exchange capacity, and greater soil aeration.

In order to accurately determine nutrient needs an estimate of available nutrients should be made. The first step in this process is to look at your trees and evaluate them for growth and color. Trees which are nutrient deficient will typically be slow growing and chlorotic. The next step is to determine the available nutrients present in

the foliage and soil. This can be accomplished through sampling the soil and foliage and having them analyzed at either the NMSU Soils Laboratory or other reputable testing facilities. These techniques should help determine the nutrient needs of your trees. Sewage sludge generally contains from 1 - 6 % nitrogen, 1 - 6 % phosphorous and < 1.5 % potassium on a dry weight basis (Clevenger et al. 1984).

A study was conducted on Pinus eldarica seedlings at the Fabian Garcia Horticulture Farm, NMSU, in which sewage sludge (30t/ac) was compared with ammonia-sulfate (75 lbs/ac) , steer manure (30t/ac) and control (no fertilizer). The study indicated that high quality Christmas trees can be produced using sewage sludge as the sole soil ammendment. (Table I) summarizes the nutrient level, on a dry weight basis, of the treatments.

Table I. Chemical analysis of macronutrients of organic amendments by percent dry weight.

Treatment	N	P	K
	- (% dry wt.) -		
Sewage Sludge (30 t/ac)	4	1.4	0.6
Steer Manure (30 t/ac)	4	0.6	2
Ammonium sulfate (75 lbs/ac)	21	0	0

Results indicate a significant increase in height and basal diameter (Table II). Crown width and number of laterals were significantly increased by the use of sewage sludge. In a rating of the trees for color and marketability as Christmas trees the sludge treated trees did as well or better than the other treatments.

Table II. Mean growth response to organic and inorganic soil amendments.

TREATMENT	SEWAGE SLUDGE	STEER MANURE	NH ₄ SO ₄	CONTROL
RATE	30 t/ac	30 t/ac	75 lbs/ac	0
FINAL HT. (ft.)*	3.5	3.4	2.9	3.3
FINAL GLD (in.)	1.1	1.0	0.9	1.0
CROWN WIDTH (in.)**	5.6	4.6	4.8	4.9
NO. LATERALS	35	29	28	31
RANKING/ MARKETABILITY **	1	4	3	2

* FINAL MEASUREMENTS 10/84

** EVALUATED 12/83

The availability, formulation, cost and method of application of sewage sludge depends upon location and size of operation. Treated sewage sludge, which is safe to

handle, is available from both commercial fertilizer operations who deal in organic ammendments, municiple waste treatment facilities who market or distribute the sludge, and nursery supply companies. Sewage sludge is available in liquid, dried, composted (sludge plus other organic material), or pelletized forms. The form of the product is dependent on the particular manufacturer or treating plant. Clevenger et al. (1984) reported that the price for sewage sludge in the various forms ranged from no charge to \$5.00/cu.yd. In most cases if there was no charge the material could be picked up at the treating plant. A check of the local waste management policy in any given area will provide information on the local availability of treated sewage sludge.

Once a source of sewage sludge is located it is necessary to obtain a copy of the nutrient analysis to ensure that the proper amount of material is applied to a Christmas tree plantation. Liquid sludge is either injected into the soil in a similar manner to anhydrous ammonia fertilization; or if open ditch irrigation is used, the sewage sludge can be moved into the field with the application of irrigation water. If dried sludge or

composted material is used, a conventional manure spreader or shovels can be used. If a pelletized product is used, a fertilizer applicator which spreads commercial mixed inorganic fertilizer can be used to distribute the material. Regardless of the type of sludge used the material should be incorporated into the soil surface to obtain maximum benefit.

In the southwestern United States, where soils are characterized by high pH levels, applications of sewage sludge do not lead to a buildup of heavy metals (McCaslin and O'Connor 1982). Repeated application of sewage sludge should improve the nutrient level and physical properties of these soils. Individual experimentation with sewage sludge applications and periodic nutrient analysis of soils and foliage should help insure a healthy and productive Christmas tree plantation.

LITERATURE CITED

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