Effect of soil types on the seed germination of Helianthus annuus L

Article · January 2003

CITATIONS
2

READS
54

3 authors, including:

Macdonald Idu
University of Benin
117 PUBLICATIONS **694** CITATIONS
SEE PROFILE

Conrad Asotie Omonhinmin
Covenant University, Ota, Ogun State, Nigeria.
41 PUBLICATIONS **109** CITATIONS
SEE PROFILE

Agric. Sci. Digest, 23 (2) : 101 - 103, 2003

EFFECT OF SOIL TYPES ON THE SEED GERMINATION OF *HELIANTHUS ANNUUS* L.

M. Idu, A.I. Ogboghodo* and A.C. Omonhinmin

Department of Biological Sciences,
Federal University of Technology, Yola, Adamawa State, Nigeria

ABSTRACT

The effects of some soil media *viz.*, sand, clay, loam + sawdust (in a 1:1 ratio), and "Garden" soil on the seed germination of 9 cultivars of the *Helianthus annuus* L. was investigated in a laboratory study. The results obtained showed that higher germination percentages of above 60% in most of the cultivars were observed in the sandy and loam + sawdust media. A consequent performance was also recorded for the garden soil treatment. However, low germination percentage of below 40% was observed in the clay treatments.

Helianthus annuus is an economic species cultivated mainly for its food, industrial and livestock uses. The species have been domesticated for such a long period that the wild form is unknown. Heiser (1965), however, considered the original form to be similar to the sub-species *Jaegei heiser.* The plant grows best in region of high elevations in the tropics as well as in lowlands, but not in wetlands. They do well in a wide range of well-drained soils. Soil suitability and effectiveness at inducing germination in seeds and subsequent seedling emergence, depends to a large extent on such physical properties as texture, aggregate size, water holding capacity consistence and bulk density of the soil. (Thompson and Troch, 1980).

Taylor (1974) reported that seedling emergence improved with finer soil aggregate size in the nursery. However, an exceeding fine particle such as clay soil often results in an impervious crust under raindrops. This condition causes water logging, surface run off/ erosion and poor aeration, all of which deter early seedling emergence. Appropriate spacing and placement of seeds may also improve germination and early emergence. This paper reports on the suitability of different soil media on the germination of 9 varieties of *Helianthus annuus* seeds, commonly cultivated in the Northern part of Nigeria.

H. annuus seeds used for the study were obtained from AFCOTT Nig. Plc., Yola, Nigeria. The nine cultivars used were Funtua (C_1), Cakinki (C_2), Saturn (C_3), Record (C_4), Perodiork (C_5), Cherniank (C_6), Isa'anka (C_7), Vnumik (C_8) and Smena (C_9).

Soil Media

Soils used were collected from Yola in Northern Nigeria. The soils are largely inceptisols and entisols. To enhance fertility, inorganic fertilizers are usually applied to these soils for purpose of crop cultivation.

The soils used for the study were categorized into four types based on texture and colour *viz.*, sandy, clay, loam + sawdust, and garden soil. Soil pH, values were 7.2, 6.6, 7.8 and 7.4 respectively. Soil samples were air dried, grounded and sieved through a 4 mm sieve. Using 18 pots per soil medium, 72 standard flowerpots (internal diameter 24 x 18 x 18 cm) were filled 3 cm from the bottom with coarse gravel and subsequently filled with the appropriate soil in duplicates, to 6 cm below the rim. Fifty randomly selected seeds of each varieties divided into 2 sets of 25 seeds each were sown equidistantly on the soil surface in each of the duplicate and finally covered with a 3 cm layer of the soil. Watering and

* Department of Agronomy, Edo State University, Ekpoma. Edo State, Nigeria.
Present address: Department of Botany, University of Benin, P.M.B. 1154, Benin City, Nigeria.

Table 1. Effect of different soil media on germination of *Helianthus annuus* seeds

**Cultivars	Treatments			
	Sand	Clay	loam+Sawdust (1:1)	Garden soil
C_1	60[b]	35[c]	60[a]	56[a]
C_2	56[b]	50[b]	74[a]	54[b]
C_3	75[a]	35[c]	55[b]	53[b]
C_4	60[a]	29[c]	61[a]	49[b]
C_5	58[a]	35[c]	66[a]	53[b]
C_6	76[a]	25[c]	70[a]	56[b]
C_7	79[a]	30[c]	67[b]	70[a]
C_8	69[a]	33[c]	56[b]	60[a]
C_9	73[a]	50[b]	75[a]	61[b]

* Germination comparison followed by the same alphabet are not significantly different at 5% level (P = 0.05)
** C_1 - Funtua, C_2 - Cakinki, C_3 Saturn, C_4 - Record, C_5 - Perodiork, C_6 - Cherniank, C_7 - Isa anka, C_8 - Vnumik, C_9 - Smena.

germination recording was carried out at 48 hr. interval. Analysis of variance was carried out using Duncan's multiple range test.

Table 1 show the percentage germination obtained for the 9 cultivars of *H. annuus* in the four soil media. Sand recorded higher germination percentages for most of the cultivars except in the cv. Cakinki (C_2), Record (C_4) and Perodiork (C_5) where the loam sawdust (1:1) recorded better results. The Garden soil treatment showed relatively high germination percentages in all the cultivars except for the cv. Record (C_4). Clay resulted in poor germination with majority of the cultivars recording less than 50% germination.

In each soil medium, germination performance of cultivars appears similar. However, comparing the soil media used analysis show significant differences in germination percentages among the cultivars (Table 1). Sand and loam sawdust (1:1) show high degree of performance in majority of the cultivars. The clay soil produced lower degree of germination percentages.

Seed germination and early emergence of resultant seedling are greatly affected by the aggregate size of the soil particles in which they are sown. The wide particle size range of the sand medium in the present study allows for good drainage and aeration. These may have enhanced the better germination/seedling emergence observed for this soil medium. Pandaya and Bighela (1973); Boada (1976); and Anoliefo and Gill (1992) using seeds of *Celosia argentea, Eucalyptus degulta* and *Bauhinia monandra* respectively, also observed higher germination percentages in white sand medium.

The poor aeration, water logging and an impervious layer formed by the compact mass structure of the clay soil may have accounted for the lower germination recorded for seeds sown in this medium. Conversely, the high results obtained for the loam + sawdust (1:1), its fine particle nature notwithstanding, may have been due to its lack of such chemical and physical properties as with clay. The relatively high germination recorded for the garden soil treatment may be linked to its moderate particle size range.

It does appear from the results of this

study that sand may be the most ideal medium for raising the seedlings of *H. annuus* cultivars in the nursery. On the other hand, the garden soil is probably more suitable for field establishment. The clay soil is least suitable for nursery use.

REFERENCES

Anoliefo, G.O. and Gill, L.S. (1992). *Agric. Res. J. Kerala,* **30**: 6-10.
Boada, E.L. (1976). *Sylvatrop Philippines Res. J.,* 1: 34-37.
Heiser, C.B. (1965). In: The Genetics of Colonizing Species (Bakerad, H.G. and Stebbin, G.L. eds.). Academic Press, New York, 401p.
Pandaya, S.C. and Bighela, N. (1973). *Trop. Ecology.,* **14**: 39-51.
Taylor, M.S. (1974). *East Africa Agric. J.,* **40**: 204-213.
Thompson, L.M. and Troch, F.R. (1980). Soils and Soil Fertility. McGraw-Hill, New York.