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Effect of organic and inorganic mulches on soil-moisture conservation, weed suppression and yield of elephant-foot yam (*Amorphophallus paeoniifolius*)

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ABSTRACT

A field investigation on elephant-foot yam (*Amorphophallus paeoniifolius* Blume) was carried out during the pre-rainy and rainy seasons (*kharif*) of 2001 and 2002 with various mulch materials, viz. transparent polythene, black polythene, wheat straw, paddy straw, banana leaf, water hyacinth (*Eichhornia crassipes*) and cowpea (*Vigna* sp.) as cover crop. Black polythene, paddy straw and water hyacinth recorded significantly higher yields (50.2–52.8 tonnes/ha), which was 7.1-28.8% more than that of no-mulch control. Black polythene recorded the highest weed-control efficiency (92.1%). Mulches conserved the soil moisture by 26.3 to 29.7% in the soil (0–30 cm). Organic and inorganic mulches were on a par with each other in maintaining the soil-moisture status. Higher benefit : cost (B:C) ratio (3.12–3.38) was observed under application of organic mulch compared with that of inorganic or synthetic mulches (1.88-2.09).

Key words : Mulches, Weed suppression, Temperature, Moisture conservation, Yield

The application of mulches on soil surface is a very common practice in high-value crops. Mulching not only increases the growth and yield of crops but also improves the soil-moisture status, nutrient utilization, weed suppression, disease control and temperature regulation of upper layers of the soil (Weeratna and Asghar, 1992; Devi Dayal *et al.*, 1995; Solaiappan *et al.*, 1999). Elephant-foot yam (*Amorphophallus paeoniifolius*) is a long-duration tropical tuber crop planted in March-April and harvested in October. Its productivity is very high both in physical (50-60 tonnes/ha) and economic terms (Rs 1-1.25 lakhs/ha). Variety 'Kovvur' is generally grown in well-drained sandy loam soils of Indo-Gangetic plains of West Bengal. Moisture stress and heavy weed infestation at sprouting stage (0-60 days after planting) delay seed germination and crop growth. Keeping this in view, the present investigation was carried out to test the performances of various organic and inorganic mulches on the crop productivity as well as weed suppression, moisture conservation and temperature regulation on the seed-corm germination of elephant-foot yam.

MATERIALS AND METHODS

The field experiment was carried out at Central Research Farm, BCKV, at Gayaspur (23° N latitude, 89° E longitude, 9.75 m above means sea-level) during 2001 and 2002. There were eight mulch treatments, viz. T_1, transparent polythene; T_2, black polythene; T_3, wheat straw; T_4, paddy straw; T_5, banana leaf; T_6, water hyacinth; T_7, cowpea as cover crop; and T_8, no mulch (hand-weeding). It was laid out in randomized block design with three replications. Organic mulches were applied @ 5 tonnes/ha after planting and polythene mulches were placed in the inter-row spaces. The soil was sandy loam, of medium fertility, having organic carbon 0.52% and soil pH 6.8. Elephant-foot yam cv 'Kovvur' was planted at a spacing of 60 cm × 60 cm in the first week of March and fertilized with NPK @ 100, 75 and 100 kg/ha. Half the nitrogen and potassium were top-dressed at the time of earthing-up, after the weeding (60 DAP). Soil moisture was taken gravimetrically from the 0-15, 15-30, 30-45 and 45-60 cm soil layers at 15 day intervals at the sprouting stage as well as at non-monsoon periods and the maximum surface soil temperature at 15 cm depth was recorded on daily basis at 2 pm. The density of weeds and their dry weights were recorded at 60 days, following the quardrat (0.25 cm × 0.25 cm) method. The crop was harvested in October.

RESULTS AND DISCUSSION

Crop productivity

Fresh-corm yield of elephant-foot yam was significantly influenced by different organic and inorganic

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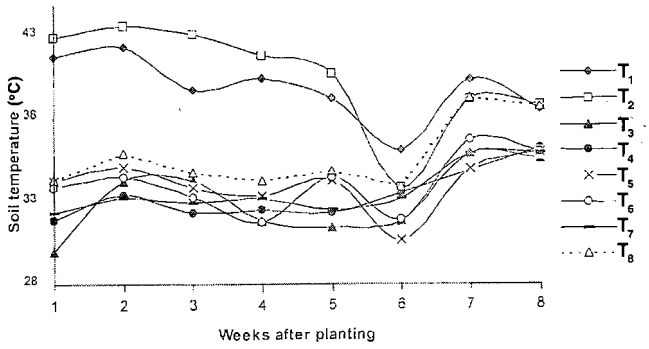

Fig. 2. Effect of mulch materials on surface-soil (0-15 cm) temperature at 2.0 pm during the stage of seed-corm sprouting (March-April)

hindered the rising soil temperature. The organic mulches maintained a static soil temperature of 32 to 36 °C during the stage of seed-corm sprouting (Devi Dayal *et al.*, 1995).

Economics

The surface mulching in elephant-foot yam increased the cost of production by 1.7-57.1% (Table 1). Net income dropped in polythene mulches due to their high cost (Rs 20,000-40,000/ha). As a result the benefit : cost ratio was the lowest in polythene mulching (1.88-2.09). But organic mulches recorded the highest benefit : cost ratio of 3.12-3.38; water hyacinth and paddy-straw mulch gave the highest B:C ratio.

Crop residues like paddy straw, wheat straw, banana leaf and even weeds like dry water hyacinth performed well when they were used as surface mulch in elephant-foot yam planted in summer. In summer the organic mulches proved more suitable for soil-moisture conservation and temperature regulation from excess summer heat and saved the crop from weed infestation at early stage. Polythene mulches are not economical and not suitable for summer-growing crops because they increase the soil temperature by 8-9 °C more than the normal bare-soil temperature.

REFERENCES

Abu-Rayyan, A.M. and Abu-Irmaileh, B.E. 2004. Onion development and yield in response to manual cultivation, herbicides or coloured mulches. *Journal of Vegetable Crop Production* **10** (1) : 37–49.

Ashworth, S. and Harison, H. 1983. Evaluation of mulches for use in the home garden. *Horticultural Science* **18** : 180–182.

Devi Dayal, Nayaik, P.R. and Daugree, B.N. 1995. Effect of mulching on soil temperature and groundnut yield during *rabi* summer season. *Groundnut News* **3** (1) : 17–22.

Gupta, C.R. and Awasthi, O.P. 1997. Effect of mulch material on growth and yield of ginger (*Zinziber officinalis* Rosc.). *Journal of Vegetable Science* **24** (1) : 13–15.

Mohankumar, C.R. and Sadanandan, N. 1988. Effect of sources of planting material and mulching on the growth and yield of taro. *Journal of Root Crops* **14** (2) : 55–77.

Solaiappan, Y., Krishnadoss, D. and Senthivel, S. 1999. Influence of legume bio-mulches on seed cotton yield and changes of properties of soil in rainfed vertisol. *Indian Journal of Agricultural Research* **33** (2) : 119–124.

Srivastava, B.K., Sharma, A.K. and Pandey, V.B. 1988. Effect of organic mulches and irrigation levels on soil temperature, water economy and yield of summer tomato. *Journal of Vegetable Science* **11** : 1–9.

Swenson, J.A., Walters, S.A. and Chong, S.K. 2004. Influence of tillage and mulching systems on soil water and tomato fruit yield and quality. *Journal of Vegetable Crop Production* **10**(1) : 81–94.

Weeratna, C.S. and Asghar, N. 1992. Effects of grass and dadap mulches on soil properties and yield of taro *(Colocasia esculenta)* in western Samoa. *Tropical Agriculture, Trinidad* **69**(1) : 83–87.