

## **Performance of winter groundnut (*Arachis hypogaea*) with polythene mulch under rainfed condition of Manipur valley**

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### **ABSTRACT**

A field experiment was conducted during the winter season 1997–98 and 1998–99 at Manipur centre, Lamphelpat Farm, Imphal, to study performance of groundnut (*Arachis hypogaea* L.) as rainfed crop under polythene mulch in broad-bed-furrow (BBF) and flat bed system of sowing. Higher production potential of 'JL 24' groundnut (1,602 kg and 2,180.7 kg pod yield/ha) was recorded with polymulch over unmulched condition (875 kg and 1,063 kg pod yield/ha). The vegetative and reproductive phases also differed under mulched and unmulched conditions. Germination was recorded 10–12 days earlier while maturity delayed by 15–20 days under polythene mulch. Number of branches/plant, dry-matter accumulation/plant, pod weight and 100-kernel weight were found significantly higher under polymulched condition than unmulched condition.

**Key words :** Groundnut, Polythene film, Mulching, Soil moisture, Soil temperature, Yield, Yield attributes

There is a wide scope to increase both area and production of groundnut in India by introducing this crop in the areas where it has been not grown earlier, especially in North-Eastern states. Manipur, which has 178,000 ha area under food grains, can come forward in groundnut cultivation, as the valley possess fertile soil, but due to lack of moisture and low temperature in the winter season the lands are kept fallow. Polythene mulch conserves soil moisture,

maintains soil-physical environment or conditions and controls weed population in the crop field and thus can be used in moisture deficit as well as sub-temperate areas. Besides, it also reduces the cost of intercultural operations. For 1 ha land about 25 kg polysheets (6–8 microns thickness) is required. Use of polysheets in agriculture is environment friendly. After use, polysheets may be collected from the crop field and can be well mixed with coaltar during

construction of *pucca* roads (Werminghausen *et al.*, 1981). The present investigation was aimed with the objective of increasing cropping intensity of Manipur valley and to find out a suitable technology for cultivation of winter groundnut.

### MATERIALS AND METHODS

The field experiment was conducted during 1997–98 and 1998–99 at ICAR Research Complex for N.E.H. Region, Manipur centre, Lamphelpat Farm, Imphal, having clay loam soil with 6.5 pH, 2.12% organic carbon and available N, P and K 6.743, 6.87 and 190.6 kg/ha respectively. The experiment was laid out in randomized block design with 5 replications and 4 treatments, viz. broad bed-furrow (BBF) with polymulch (T<sub>1</sub>), broad bed-furrow without polymulch (T<sub>2</sub>), flat bed with polymulch (T<sub>3</sub>) and flat bed without polymulch (T<sub>4</sub>). Net width of bed for BBF system was 60 cm, with a furrow width of 30 cm. A space of 15 cm was kept in each bed in addition to cover the polythene edges. Thus, the gross size of each bed was 75 cm. After covering the beds from polysheets (8 micron thickness), holes were made with the help of bamboo poles at 15-cm interval and 30 cm row spacing. Two seeds were sown in each hole. The recommended dose of plant nutrients @ 20 kg N, 25.8 kg P and 49.8 kg K/ha were applied basal. Application of 2.0 tonnes lime/ha was also made basal for amelioration of soil as recommended by Misra *et al.* (1989). After germination, leaves and branches were brought out from the holes with the help of fingers. The observations on growth parameters were taken on 30, 60, 90 days after sowing

(DAS) and at maturity. Yield and yield attributes were recorded at maturity on 5 random plants. Soil moisture and soil temperature were recorded with the help of soil-moisture meter and soil thermometer respectively for making better comparison.

### RESULTS AND DISCUSSION

#### *Soil moisture and temperature*

Groundnut 'JL 24', belonging to Spanish group, showed more pod yield on account of their pronounced effect on growth and yield attributes under polymulched condition compared with unmulched condition. Germination was found 8 days earlier in polythene-mulched condition in both flat bed and broad bed-furrow systems owing to better soil-moisture availability and optimum soil temperature, which had favoured the early emergence of polymulched groundnut. In morning hours (6.00 AM) soil temperature was observed around 3.0 to 3.7°C higher but was found 1.0 to 1.8°C lower in afternoon (14.00 p.m.) under polymulched condition compared with unmulched condition. Huwenguang *et al.* (1995) also reported the similar findings. Average soil moisture of 42% was found throughout the crop season under polymulched condition, while average soil moisture was only 28% in unmulched condition.

#### *Growth parameters*

Plant height was significantly higher under flat bed system of sowing with polythene mulch than that under unmulched condition at each growth stage. Further, plant height in BBF system of sowing with polymulch was recorded on a par with flat bed system under polymulch (Table 1). Plant had attained maximum

number of branches at maturity. However, there was not much variation in branches/plant at 90 days after sowing (DAS) and at maturity. Branches/plant were found significantly higher under flat bed system of sowing at 30, 60 and 90 DAS than BBF system of sowing with polymulch over unmulched condition, but number of branches at maturity in BBF system was found at par with flat bed system with polymulched condition over unmulched condition (Table 1). The results confirm the findings of Ravindranath *et al.* (1974) in sorghum under mulched condition.

Functional leaves/plant were found highest at 90 DAS and thereafter started declining due to senescence. The functional leaves/plant under flat bed system were found at par with BBF system under polymulch at 30 and 60 DAS, but at later stages (i.e. at 90 DAS and at maturity) flat bed system under polymulch resulted in significantly higher number of leaves/plant over all other treatments.

In general, plant showed maximum dry matter at maturity. Dry matter/plant was higher under both the systems of sowing under polymulched condition over unmulched condition. Further, dry matter/plant was significantly higher under flat bed system at 90 DAS and at maturity, followed by BBF system, but there was no significant difference in total dry matter/plant between flat bed system and BBF system with polymulch (Table 1). Our finding support those of Werminghausen *et al.* (1981).

#### Yield and yield attributes

The highest pod yield/ha was found in flat bed system with polymulch compared

Table 1. Growth characters at different growth stages of polythene film groundnut trial (pooled data of 1997-98 and 1998-99)

Treatment	Plant height (cm)			Branches/plant			Leaves/plant			Dry matter/plant				
	30 days*	60 days	90 days	30 days	60 days	90 days	30 days	60 days	90 days	30 days	60 days	90 days		
T <sub>1</sub>	11.9	13.7	21.7	5.3	5.9	10.5	11.7	15.9	26.6	35.2	31.1	4.8	7.2	23.1
T <sub>2</sub>	8.4	8.4	11.9	16.6	33.6	4.2	5.0	6.2	6.9	9.5	16.5	24.6	22.6	1.5
T <sub>3</sub>	13.4	15.4	23.1	37.2	6.9	7.1	11.7	12.9	17.9	31.9	47.0	37.9	6.2	8.7
T <sub>4</sub>	9.6	12.3	18.2	35.0	5.0	5.1	8.9	9.2	9.5	17.1	20.5	20.4	1.7	4.4
CD (P=0.01)	2.93	3.29	5.11	5.25	0.8	1.2	1.0	1.71	6.56	5.36	10.4	4.97	1.52	3.31

Details of treatments are given under Materials and Methods

\*Days, Days after sowing

**Table 2.** Yield and yield-attributing characters at maturity of polythene film groundnut trial (pooled data of 1997–98 and 1998–99)

Treatment	Pods/ plant	Pod weight/ plant (g)	Pod yield (kg/ha)	100-kernel weight (g)	Kernel yield (kg/ha)	Oil yield (kg/ha)
T <sub>1</sub>	21.28	72.6	1,602.0	38.0	1,127.9	553.0
T <sub>2</sub>	12.01	44.4	875.0	34.1	568.80	211.5
T <sub>3</sub>	27.60	104.9	2,180.7	42.5	1,618.0	782.7
T <sub>4</sub>	17.60	63.4	1,063.0	37.5	734.6	309.8
CD (P = 0.01)	5.21	27.2	427.4	04.5	339.2	157.2

Details of treatments are given under Materials and Methods

with all other treatments, and was followed by BBF system with polymulch. This higher pod yield/ha with polymulch may be owing to better soil-moisture availability and optimum temperature during crop season. Daulay *et al.* (1979) also reported similar findings in case of potato. Germination, flowering and pegging showed 8–10 days, 15–20 days and 10–14 days earlier respectively, while maturity was delayed by 15–20 days with polymulch over unmulched plots. This may be due to the fact that polymulched plots had got longer reproductive period than unmulched plots which had again favoured the higher number of pods/plant, pod weight/plant, 100-kernel weight and pod yield/ha. Reddy and Venkatachari (1980) also reported the similar finding in different field crops under mulched condition. Pod yield/plant (0.583\*) was positively correlated with branches/plant. A positive significant regression coefficient between total dry matter/plant at harvest and pods/plant was also found by Shilke and Khuspe (1982).

Besides, the reflection of sunlight 30 cm above the soil surface was 5.3–13.0% with polythene film but only 2.4–4.0% without

it. The accumulated temperature by poly-mulched groundnut during 0600–1400 hr was 3.7°C higher but somewhat lower during 1400–2000; and wind speed within polymulched groundnut rows was 0.01–0.03 m/s faster than unmulched plots. Faster wind speed favours air exchange and CO<sub>2</sub> movement. All these interlinked factors had increased the photosynthetic efficiency of polythene-mulched groundnut, resulting in yield higher under polythene mulched groundnut than unmulched crop (Huwenguang *et al.*, 1995).

The flat bed system with polymulch showed better soil moisture (47.2%) throughout the crop season whereas BBF system showed lesser soil-moisture (36.8%) in polymulched condition, because flat bed system exposed lesser area to the sun compared with BBF system. Thus more evaporation from the bed edges had taken place, i.e. lesser soil-moisture availability to the crops and had yielded lower than flat bed system.

It was concluded that winter groundnut can be grown successfully with polymulch in Manipur valley as rainfed crop. Further, it will be more profitable if winter groundnut is

grown with polymulch in flat bed system of sowing. Despite higher productivity from above 2 systems of sowing, it should be tested further against different fertility levels, varieties and moisture regimes for more income generation from single crop.

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