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Root Growth of Rainfed Groundnut as Influenced by Different Moisture Conservation Practices

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ABSTRACT

The primary constraint for agricultural development in dry regions is lack of suitable technology for soil and water management under varied rainfall conditions. In many areas, the total precipitation is sufficient for one and in some cases for two good crops per year. However, the rainfall patterns are erratic and extended droughts are common. Hence, the present investigation was carried out at S.V.Agricultural College, Tirupati between June 29 to October 17 during kharif, 2016-17 to study the effect of in-situ moisture conservation practices on root growth of rainfed groundnut (Arachis hypogaea). The results of the study shown that maximum root length (cm) and root dry weight (gm) was observed with broad bed and furrow method of moisture conservation practice. Significantly higher and consistent availability of soil moisture was recorded by broad bed and furrows which resulted in increased root length of groundnut over conventional tillage. Hence, broad bed and furrow method was found to be the best practice for enhanced soil moisture availability as compared to other conservation practices.

Key words: *Broad bed and furrow system, Groundnut, Root growth, Rainfed.*

INTRODUCTION

Groundnut is an important commercial crop in rainfed areas which contributes about 40 per cent to the total oilseeds production in the country. India ranks second both in area and production of groundnut which is grown under both rainfed and irrigated conditions. It contributes to an extent of 60 per cent to the total edible oilseed production in the country. Soils in Rayalaseema region of Andhra Pradesh where groundnut is raised are either sandy or sandy clay loams. They are characterized by the presence of hard pans even at shallow depths, low infiltration rate and water holding capacity.

Evaporation from the soil contributes to more than 50 per cent of total evapotranspiration. Therefore, if evaporation is reduced, it may be possible to raise a fairly good crop even in years of low rainfall. Mulches can reduce evaporation and control soil temperature and promote good root development and microbial action.

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While considerable importance has been given to increase the productivity of the irrigated lands under green revolution, sufficient attention has not been given to increase the productivity of the rainfed areas. The moisture is the key limiting factor in the rainfed farming and rainfall is the only source of water for these vast stretch of lands. Hence, it is necessary to harvest maximum rain water and adopt methods to maximise the retention of moisture.

MATERIAL AND METHODS

The soil of the experimental site was red sandy loam. Composite soil samples were collected from 0-45 cm depth of the experimental area before imposition of the treatments. The soil samples were air-dried, powdered and allowed to pass through 2 mm sieve and were analyzed for chemical properties. The soil was neutral in reaction (7.5), low in organic carbon (0.38 %) and available nitrogen (149.8 kg ha^{-1}), medium in available phosphorous (11.8 kg ha^{-1}) and available potassium (161.3 kg ha^{-1}).

The experiment was laid out in randomized block design with three replications. There were eight soil moisture conservation methods. Conventional tillage (T_1), vertical tillage with subsoiler upto a depth of 60 cm at an interval of 1.0 m followed by secondary tillage (T_2), deep ploughing with mouldboard plough upto a depth of 40 cm followed by secondary tillage (T_3), conservation furrow after every row (T_4), conservation furrow after every four rows (T_5), broad bed and furrows (90/30 cm) (T_6), straw mulch @ 5 tonnes ha^{-1} (T_7) and soil mulch (frequent intercultivation) (T_8).

Soil moisture at 0 - 30 and 30 - 60 cm soil depth during period of crop growth was measured gravimetrically to assess the influence of these treatments on the productivity of groundnut. For each treatment five plants were randomly selected for observations. The observations on root growth and root length were recorded at harvest of groundnut crop.

RESULTS AND DISCUSSION

There was no significant difference between broad bed and furrows (T_6) (17.0 cm) and vertical tillage (T_2) (17.1 cm), deep ploughing (T_3) (16.3 cm) and straw mulch (T_7) (16.1 cm) with regard to root length which was followed by conservation furrow after every row (T_4) (13.0 cm), conservation furrow after every four rows (T_5) (13.1 cm) and soil mulch (T_8) (12.2 cm).

This might be ascribed to the best performance of the crop under comfortable moisture, resulting in better root growth[3]. Root length was greatly reduced in conventional tillage (T_1) (12.2 cm) because of lower soil moisture content. The above results are in conformity with the findings of Cai *et al*[1].

Data pertaining to root length and root dry weight of groundnut as affected by different moisture conservation practices are presented in Table 1.

The root dry weight was maximum with broad bed and furrows (T_6) which was significantly superior to vertical tillage (T_2) (0.85 g) and deep ploughing (T_3) (0.77 g). Straw mulch (T_7) (0.66 g) was on par with conservation furrow after every row (T_4) (0.64 g) and conservation furrow after every four rows (T_5) (0.62). The lowest root dry weight of 0.45 g was recorded with conventional tillage (T_1).

Among the different moisture conservation practices tried, broad bed and furrows (T_6) recorded maximum root growth and found to be superior to rest of the treatments. This might be due to favorable soil physical conditions which play an important role in the root extension and absorption of moisture and nutrients. Better root development in vertical tillage (T_2) might be due to the better available soil moisture regime. Similar results were reported by Ramana *et al*[2].

Among *in-situ* moisture conservation measures, broad bed and furrows significantly increased the root growth. The difference in the response of growth parameters to various *in-situ* moisture conservation treatments was purely due to the differences in the moisture holding and retaining efficiency of treatments[4]. The results clearly indicate that broad bed and furrows are effective for conserving rain water with crop growth stature of rainfed groundnut on sandy-loam soil.

Table: 1: Root growth of groundnut as influenced by different *in-situ* moisture conservation practices (pooled data)

Treatments	Root length (cm)	Root dry weight (g)
T_1: Conventional Tillage	12.2	0.45
T_2: Vertical tillage with subsoiler upto a depth of 60 cm at an interval of 1.0 m followed by secondary tillage	17.1	0.85
T_3: Deep ploughing with mouldboard plough upto a depth of 40 cm followed by secondary tillage	16.3	0.77
T_4: Conservation furrow after every row	13.0	0.64
T_5: Conservation furrow after every four rows	13.1	0.62
T_6: Broad bed and furrow (90/30 cm)	17.0	0.93
T_7: Straw mulch @ 5 tonnes ha^{-1}	16.1	0.66
T_8: Soil mulch (frequent intercultivations)	12.2	0.51
SEm±	0.37	0.02
CD (P=0.05)	1.1	0.06

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