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In-situ moisture conservation practices on growth characters of rainfed groundnut

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ABSTRACT
A field experiment was conducted during kharif, 2016-17 on sandy loam soils of dryland farm at S.V.Agricultural College, Tirupati to study the effect of in-situ moisture conservation practices on growth parameters of rainfed groundnut (Arachis hypogaea). The moisture conservation practice, broad bed and furrow method was found to be the best with improved crop growth stature, yield attributes and yield of groundnut. There was progressive increase in plant height, leaf area index, dry matter production and relative water content under broad bed and furrows.
Key words: *Broad bed and furrow system, Groundnut, Growth parameters, Rainfed.*

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INTRODUCTION

Groundnut is the most important oilseed cum legume crop grown in India. 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. In India, it is grown in an area of 4.7 million hectares with an annual production of 7.4 million tonnes and productivity of 1552 kg ha^{-1}. Andhra Pradesh ranks second in production with 0.49 million tonnes from an area of 0.87 million hectares (*www.indiastat.com*).

Groundnut is the major *kharif* crop in alfisols of Rayalaseema region of Andhra Pradesh. In Chitoor district of Andhra Pradesh, it is mostly grown as a pure crop under rainfed conditions. But the productivity of groundnut is low, since its cultivation is confined to drylands, poor and impoverished soils. 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. To overcome these adverse soil conditions, there is a need to provide suitable physical enviornment for better growth and development of groundnut.

MATERIAL AND METHODS

The field experiment was conducted in field no. 138 of S.V. Agricultural College Dryland Farm, Tirupati campus of Acharya N. G. Ranga Agricultural University, which is geographically situated at 13.5^0N latitude and 79.5^0E longitude with an altitude of 182.9 m above the mean sea level in the Southern Agro-Climatic Zone of Andhra Pradesh. The experimental 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}). There were eight soil moisture conservation methods. All these were tested in randomized block design, replicated thrice.

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).

Rainfall during the crop period was about 340 mm which was received in 20 rainy days. 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. Observations were recorded on growth

parameters *viz*., plant height, leaf area index, dry matter production, relative water content, days to 50 % flowering and days to maturity.

RESULTS AND DISCUSSION

There was a progressive increase in plant height with advancement in age of the crop up to harvest. At all the stages of observation *viz*., 25, 50, 75 DAS and at harvest, the plants were taller in broad bed and furrows (T_6) which was however on par with vertical tillage (T_2) and deep ploughing (T_3) and straw mulch (T_7). The shortest groundnut plants were observed in conventional tillage (T_1).

Taller plants in broad bed and furrows might be due to the higher soil moisture content. Broad bed and furrows might have retained more moisture to be available to plants to put up better growth. Chavan *et al*. (2015) also reported that broad bed and furrows enhanced the soil moisture conservation and moisture availability during crop growth to increase plant stand and plant height .

The leaf area index of groundnut increased progressively up to 75 DAS, beyond which it tended to decline towards harvest. At all the crop growth stages, maximum leaf area index was recorded with broad bed and furrows (T_6) which was however, on par with vertical tillage (T_2) and deep ploughing (T_3), but superior to conventional tillage (T_1).

Leaf area index tended to increase upto 75 DAS, beyond which it declined towards harvest, which might be due to limited vegetative growth and senescence of older foliage, as the crop aheads to maturity. These results are in agreement with the findings of Prasad (1994) and Pratibha *et al*. (1995).

Dry matter production of groundnut tended to increase progressively up to harvest. At all the growth stages, groundnut when sown under broad bed furrows (T_6) recorded the highest total dry matter which was significantly greater than vertical tillage (T_2), deep ploughing (T_3) and straw mulch (T_7) whereas conventional tillage (T_1) produced the lowest dry matter at all the stages of observation. The highest amount of dry matter in broad bed and furrows might be due to better soil physical conditions as the furrows helped in retaining excess moisture in the root zone which resulted in better crop growth. These results are in close agreement with the findings of Venkateswarlu and Malaviya (2004).

Among the different moisture conservation practices tried, broad bed and furrows (T_6) recorded the highest relative water content and found to be superior to rest of the treatments. The higher relative water content in this system might be due to favorable soil physical conditions which play an important role in the root extension and absorption of moisture and nutrients. Increased relative water content in vertical tillage (T_2) might be due to the better available soil moisture regime. Similar results were reported by Ramana *et al*. (2015).

Conventional tillage (T_1) (34) took significantly longer time to attain 50 per cent flowering which was on par with soil mulch (T_8) (32) and conservation furrow after every four rows (T_5) (32). Longer duration with 50 per cent flowering with these treatments might be due to lower soil moisture content maintained in the respective treatments.

Broad bed and furrows (T_6) took significantly shorter time to attain maturity (97) followed by vertical tillage (T_2) (97) and deep ploughing (T_8) (98). There was no significant difference in days to maturity due to conservation furrow after every row (T_4) (100) and conservation furrow after every four rows (T_5) (101). Significantly longer time to attain maturity was recorded under conventional tillage (T_1) (104). The results are in conformity with the findings of Vaghasia and Khanpara (2007).

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. Growth characters of groundnut as influenced by different moisture conservation practices (pooled data)

Treatments	Plant height (cm)	Leaf Area Index	Dry matter Production (kg ha^{-1})	Relative water content (%)	Days to 50 % flowering	Days to maturity
T_1	24.1	1.07	2564	57.4	34	104
T_2	31.2	1.31	3156	71.8	29	97
T_3	30.5	1.26	3142	70.8	29	98
T_4	27.8	1.18	2834	63.2	30	100
T_5	25.2	1.15	2571	61.3	32	101
T_6	31.3	1.34	3452	76.3	29	97
T_7	30.2	1.22	2847	65.8	29	99
T_8	25.9	1.10	2569	58.8	32	103

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