



Performance Of Pearl Millet [*Pennisetum Glaucum* (L.) R. Br. Emend Stuntz] - Legume Intercropping Systems Under Rainfed Conditions

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ABSTRACT

A field experiment was conducted during kharif, 2015 at S.V. Agricultural College Farm; Tirupati to study the comparative performance of different pearl millet based intercropping systems. The results revealed that sole pearl millet planted at 45 cm x 12 cm (T₁) produced higher stature of growth, grain and stover yields of pearl millet. Whereas among the intercropping systems tried, pearl millet + cowpea in 2:2 PRS (T₄) produced higher stature of growth, pearl millet equivalent yield while they were to at their lowest with pearl millet + groundnut in 1:1 URS (T₅).

Key words: Pearl millet, Legume, Row ratios, Yield

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INTRODUCTION

Pearl millet is an important crop grown for food and fodder for human and livestock population in dryland areas. Pearl millet cultivation is mostly confined to rainfed lands, poor and impoverished soils. So, growing of pearl millet as a sole crop under this situation is risky and uneconomical. It is a fast growing short duration crop which has high biomass production potential. Intercropping is the best solution that can increase the production and productivity by better utilization of available resources and thereby helps to minimize the risks and brings stability under rainfed conditions. Intercropping of pearl millet with grain legumes such as cowpea, greengram and oilseed crop like groundnut is a common recommended practice.

Plant population and spatial arrangement in intercropping have important effects on the balance of competition between component crops and their productivity. Spatial arrangement in intercropping has important effects on balance of competition between component crops, economics and soil fertility status which varies with region and crop.

Information regarding geometrical requirement of intercropping was scanty, particularly with pearl millet. In view of these facts, there is a need to find out profitable intercrop ratio for pearl millet based intercropping system. Therefore, the present study was undertaken to study the performance of pearl millet based intercropping systems under rainfed conditions

MATERIALS AND METHODS

A field experiment was carried out during *kharif*, 2015 at S.V. Agricultural College Farm, Tirupati. The experimental soil was sandy loam in texture, slightly acidic in soil reaction, low in available nitrogen and medium in organic carbon, available phosphorus and available potassium. The experiment was laid out in a Randomized Block Design with eight treatments and replicated thrice. The treatments comprised of sole pearl millet planted at 45 cm x 12 cm (T₁), sole pearl millet in paired row spacing 40/80 cm (T₂), pearl millet + cowpea in 1:1 uniform row spacing (URS) (T₃), pearl millet + cowpea in 2:2 paired row spacing (PRS) (T₄), pearl millet + groundnut in 1:1 uniform row spacing (URS) (T₅), pearl millet + groundnut in 2:2 paired row spacing (PRS) (T₆), pearl millet + greengram in 1:1 uniform row spacing (URS) (T₇), pearl millet + greengram in 2:2 paired row spacing (PRS) (T₈). The hybrid and varieties tested in this experiment were ABH-1 (Pearl millet), TPTC-29 (Cowpea), Dharani (Groundnut) and LGG - 460 (Greengram). Sole crop of pearl millet was sown at 45 cm x 12 cm and in paired rows at 40/80 cm with

an intra row spacing of 10 cm. While under intercropping systems, pearl millet was sown at 60 cm x 10 cm in 1:1 ratio and in paired rows of 40/80 cm in 2:2 ratio with an intra row spacing of 10 cm. Two rows of intercrops *viz.*, cowpea, groundnut and greengram were sown at 30 cm x 10 cm in between paired rows of pearl millet in 2:2 ratio, while in 1:1 ratio the intercrops cowpea, groundnut and greengram were sown at 60 cm x 10 cm in between the pearl millet rows. The recommended dose of 60 kg N, 30 kg P₂O₅ and 20 kg K₂O ha⁻¹ was applied through urea, single super phosphate and muriate of potash for pearl millet, 20 kg N, 50 kg P₂O₅ kg ha⁻¹ for cowpea and greengram and 20 kg N, 40 kg P₂O₅ and 50 K₂O kg ha⁻¹ for groundnut respectively. For pearl millet, entire dose of phosphorous, potassium and half of the dose of nitrogen were applied as basal at the time of sowing and the remaining half of the nitrogen was top dressed at 30 DAS.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads.

Growth attributes:

The results revealed that growth parameters of pearl millet *viz.*, plant height, LAI, dry matter production and number of tillers hill⁻¹ were significantly influenced by the sole crop and intercropping systems. The stature of all the growth parameters were found to be highest with sole pearl millet at 45 cm x 12 cm (T₁) which was followed by sole pearl millet in paired row spacing of 40/80 cm (T₂) with no significant difference between them. Among intercropping systems, growth parameters of pearl millet was maximum with pearl millet + cowpea in 2:2 PRS (T₄) whereas pearl millet + groundnut in 1:1 uniform row spacing gave the lowest at all growth stages. Likewise growth parameters of intercrops *viz.*, cowpea, groundnut and greengram were maximum when grown as sole crops, followed by intercropping of legumes with pearl millet in 2:2 paired row spacing and 1:1 uniform row spacing in order of descent. The results are in agreement with the findings of Choudhary (2009) and Ghilotia *et al.* (2015).

YIELD:

Grain and stover yields of pearl millet were significantly affected due to legume intercropping. Significantly, the highest grain and stover yields of pearl millet were recorded with sole crop as compared to pearl millet grown with all intercrops at different ratios. This might be due to higher competition offered by intercrops to pearl millet for natural resources like space, nutrients, moisture and incoming solar radiation. The results corroborate with the findings of Kumar *et al.* (2006).

Maximum pearl millet grain and stover yields was recorded with pearl millet + cowpea by 2:2 PRS (T₄), which was however on par with pearl millet + greengram in 2:2 PRS. The lowest pearl millet grain yield was noticed with pearl millet + groundnut in 1:1 URS (T₅).

Significant differences were not observed among different planting systems with regard to harvest index. However, the maximum harvest index was recorded with pearl millet + groundnut in 1:1 URS (T₅) whereas the lowest harvest index was recorded with sole pearl millet at 45 cm x 12 cm (T₁).

Lower grain and stover yields of pearl millet were noticed when pearl millet was intercropped with cowpea, groundnut and greengram at 1:1 uniform row spacing, which might be due to higher competition offered by the intercrops for natural resources like space, plant nutrients, moisture and incoming solar radiation in 1:1 URS compared to 2:2 PRS. Under 1:1 URS, the competition from intercrops was on both sides of pearl millet rows, where as in 2:2 PRS, the competition was on one side of the pearl millet paired rows only. This resulted in lower yield of pearl millet in intercropping systems in 1:1 URS compared to 2:2 PRS. The results are in agreement with the findings of Yadav and Yadav (2001), Kumar *et al.* (2006), Choudhary (2009) and Ghilotia *et al.* (2015).

Table.1. Growth parameters and yield of pearl millet at harvest as influenced by pearl millet + legume intercropping

Treatments	Plant height (cm)	Leaf area index	Dry matter production (g plant ⁻¹)	Number of tillers hill ⁻¹	Grain yield (kg ha ⁻¹)	Stover yield (kg ha ⁻¹)
T ₁ : Sole pearl millet (45 cm x 12 cm)	250.7	1.44	60.1	3.9	1661	3799
T ₂ : Sole pearl millet in paired row spacing of (40/80 cm)	248.3	1.30	59.4	3.8	1624	3665
T ₃ : Pearl millet + cowpea in 1:1 URS	235.8	0.78	55.4	3.5	1540	2927
T ₄ : Pearl millet + cowpea in 2:2 PRS	247.7	1.19	56.7	3.7	1615	3115
T ₅ : Pearl millet + groundnut in 1:1 URS	219.0	0.65	46.5	2.8	1465	2485
T ₆ : Pearl millet + groundnut in 2:2 PRS	225.0	0.83	55.1	3.4	1509	2905

T ₇ : Pearl millet + greengram in 1:1 URS	233.3	0.77	53.0	3.1	1490	2692
T ₈ : Pearl millet + greengram in 2:2 PRS	244.8	0.85	56.5	3.6	1580	3015
SEm±	5.96	0.05	2.41	0.18	40.0	128.6
CD (P=0.05)	18.2	0.16	7.4	0.5	123	393

Table.2. Growth parameters and yield of intercrops at harvest as influenced by pearl millet intercropping

Treatments	Plant height (cm)	Leaf area index	Dry matter production (g plant ⁻¹)	Seed yield (kg ha ⁻¹)	Haulm yield (kg ha ⁻¹)
Sole cowpea	78.9	1.1	3105	690	1926
Sole groundnut	67.5	1.6	3218	1263	2247
Sole greengram	72.6	2.7	2562	625	1459
Pearl millet + cowpea in 1:1 URS	64.2	0.9	2930	450	1495
Pearl millet + cowpea in 2:2 PRS	72.5	1.0	3045	475	1558
Pearl millet + groundnut in 1:1 URS	60.5	1.3	2789	885	1645
Pearl millet + groundnut in 2:2 PRS	60.8	1.5	2809	951	1867
Pearl millet + greengram in 1:1 URS	67.3	2.1	2409	379	1151
Pearl millet + greengram in 2:2 PRS	70.7	2.4	2453	390	1220

CONCLUSIONS

Sole pearl millet planted at 45 cm x 12 cm recorded higher growth parameters and yield than other planting systems. Among the intercropping systems, pearl millet + cowpea in 2:2 paired row spacing results in higher growth parameters and yield as compared to other intercropping systems in sandy loam soils of Tirupati.

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