



Research Article

EVALUATION OF DIFFERENT MILLET BASED CROP SEQUENCES SUITABLE FOR NSP RIGHT CANAL AREAS

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Abstract: A field experiment was conducted on clay soils of Regional Agricultural Research Station, Lam, Guntur during *kharif* and *rabi* of 2016-17, 2017-18 & 2018-19 to find out best crop sequence that is easily adaptable and economically viable for the vertisols of NSP right canal areas of Krishna zone. Among the *kharif* crops foxtail millet followed by pearl millet performed better with higher grain yield while finger millet recorded lower grain yield with longer crop duration (110 days). Among the *rabi* crops bengalgram recorded higher grain yield while both greengram and blackgram recorded very poor grain yield. As a crop sequence foxtail millet followed by bengalgram (2.6) and pearl millet followed by bengalgram (1.43) recorded higher BCR followed by finger millet-bengalgram crop sequence. All crop sequences with blackgram and greengram were recorded lower BCR due to poor yield of succeeding blackgram and greengram.

Keywords: Sequence, Preceding, Succeeding, Bengalgram, Blackgram, Greengram

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Introduction

Blackgram, greengram and bengalgram, crops are being cultivated as *rabi* crops in vertisols of Andhra Pradesh after keeping the land as fallow during *kharif* season. In Andhra Pradesh bengalgram cultivated in an area of 4.42 L.ha, blackgram in 3.60 L.ha, greengram 1.29 L.ha during *rabi* by keeping *kharif* season as fallow. In some area's short duration millets like ragi, bajra and korra are being cultivated as *kharif* crops by keeping the land as fallow during *rabi*. However, there is a scope to take up preceding short duration *kharif* millets succeeding to *rabi* pulses by taking an advantage of rain received during the southwest monsoon preceding to *rabi*, which not only helps in optimum utilization of available resources but also sustaining the millet-legume crop sequence besides avoiding the occurrence of soil borne diseases in addition to the nitrogen fixation to the soil.

Identification of a better crop sequence suitable to vertisols of Krishna agro-climatic zone helps the farmers to overcome mono cropping of *kharif* millets and *rabi* pulses which in turn results in optimum utilization of resources and sustaining the productivity with higher monetary benefits. And also, Identification of remunerative crop sequence for vertisols of NSP right canal suitable to replace mono cropping of bengalgram not only helps the farmer to sustain the productivity but also results in avoiding the occurrence of its related soil borne diseases and restore the atmospheric nitrogen. Under these circumstances a study on the performance of important millet crops preceding to bengalgram and also other pulse crops alternative to bengalgram in a crop sequence mode in place of mono cropping of bengalgram alone in vertisols of Andhra Pradesh was initiated and this might be helped the farmers to get higher productivity and good net returns besides sustaining the productivity in vertisols of Andhra Pradesh and an alternative to bengalgram for *rabi* season.

This knowledge is meagre in and around the Krishna zone hence, an attempt was made on crop sequence that is easily adaptable and economically viable in the vertisols of NSP right canal areas of Andhra Pradesh.

Material and methods

Field experiment was conducted at Regional Agricultural Research Station, Lam Farm Guntur located at a Latitude:16°18', Longitude: 80°29', Altitude:33 mt MSL. The climate is sub-tropical with a mean annual rainfall of 930 mm. An amount of 679.8, 694.6- and 776.3-mm rain was received in 56, 43 and 47 rainy days respectively during the experimentation. The soil of the experimental field was clay loam in texture, neutral to slightly alkaline in reaction (pH 7.8 to 8.2). Low in available N (204 kg ha⁻¹), high in P₂O₅ (97kg ha⁻¹) and K₂O (887 kg ha⁻¹) and medium in organic carbon (0.51%), respectively. The experiment was conducted for three successive *kharif* and *rabi* seasons of 2016-17, 2017-18 and 2018-19 in Krishna agro-climatic zone of Andhra Pradesh.

The experiment consisting of three *kharif* crops viz., Bajra (*Pennisetum glaucum*), foxtail millet/ korra (*Panicum italicum*) and Finger millet/ ragi (*Eleusine coracana*) and three *rabi* crops like blackgram (*Vigna mungo*), Green gram (*Vigna radiata*) and Bengalgram (*Cicer arietinum*) and these crops were sequencing each other in combination i.e., T1: Bajra fb Bengalgram, T2: Bajra fb Blackgram, T3: Bajra fb Greengram, T4::Korra fb Bengalgram, T5:Korra fb Blackgram, T6: Korra fb reengram, T7:Ragi fb Bengalgram, T8: Ragi fb Blackgram and T9: Ragi fb Greengram. All treatments were randomly allocated and replicated thrice in randomized block design for both *kharif* and *rabi* crops along with sequence was adopted for three years of experimentation. The recommended package of practices was adopted during the experimentation. A popular medium duration millet varieties Suryanandi (Korra), Champavathi (Ragi) and hybrid bajra were used during *Kharif* and pulses varieties PU-31 (Blackgram), LGG-460 (Greengram) and JG-11 (Bengalgram) were used in three years of study. The data pertaining yield was recorded and net returns, B:C were calculated, the data on experimentation was statistically analyzed by using variance technique as suggested by Gomez and Gomez (1984) [1]. Statistical significance was tested by applying F-test at 0.05 level of probability and critical difference (CD) was calculated for those parameters.

Table-1 Grain Yield (kg/ha) Net Returns & BCR of different millet pulse base d cropping sequence

Crop Sequence Kharif – Rabi	Grain Yield (Kg ha ⁻¹)						Net Returns from the sequence (Rs ha ⁻¹)			Benefit Cost Ratio		
	Kharif			Rabi			2016-17	2017-18	2018-19	2016-17	2017-18	2018-19
	2016-17	2017-18	2018-19	2016-17	2017-18	2018-19						
T1= Pearlmillet fb Bengalgram	1545	2386	726	1615	2922	3086	51812	97819	82859	1.40	1.56	1.43
T2= Pearlmillet fb Blackgram	1526	2218	711	334	1317	1319	6132	55926	31422	0.40	1.06	0.58
T3= Pearlmillet fb Greengram	1543	2180	630	322	1399	898	3858	61691	3559	0.07	1.13	0.09
T4= foxtail millet fb Bengalgram	1951	2675	1600	1706	2739	2859	88615	110066	129170	1.42	1.92	2.6
T5= foxtail millet fb Blackgram	2015	2592	1578	370	1398	1200	19438	77112	83202	0.35	1.62	1.70
T6= foxtail millet fb Greengram	2040	2551	1319	326	1481	1270	15661	81845	65941	0.31	1.62	1.30
T7= fingermillet fb Bengalgram	1488	2099	667	1620	2860	2681	7189	100167	68548	1.15	1.65	1.30
T8= fingermillet fb Blackgram	1498	2214	252	360	1276	963	5860	64264	3230	0.12	1.21	0.03
T9= fingermillet fb Greengram	1480	2057	255	326	1440	919	2538	71509	2699	0.05	1.29	0.07
Sem+	-	--	-	-	--	-	8446	3244	5358.36	0.05	0.06	0.09
CD (P=0.05)	-	--	-	-	--	-	2532	9725	16062.66	0.15	0.18	0.29
CV%	-	--	-	-	--	-	19.5	7.00	17.7	16.5	7.4	16.8

Results and Discussion

Among the *kharif* crops foxtail millet (1951, 2675 and 1600 kg ha⁻¹) followed by Pearlmillet (1542, 2386 and 726 kg ha⁻¹) performed better with higher grain yield while fingermillet recorded lower grain yield of 1488, 2099 and 667 kg ha⁻¹ with longer crop duration (110 days) during three years of the experimentation. Among the *rabi* crops bengalgram recorded higher grain yield of 1615, 2922 and 3086 kg ha⁻¹ while both greengram (898, 1399 and 322 kg ha⁻¹) and blackgram (1270, 1481 and 326 kg/ha) recorded very poor grain yield during the three years of the experimentation. Among the crop sequences foxtail millet followed by recorded higher BCR of 1.42, 1.92 and 2.6 respectively followed by bajra- bengalgram (1.40, 1.56 and 1.43) than ragi-bengalgram crop sequence. All crop sequences with blackgram and greengram were recorded lower BCR [Table-1]. These findings are similar to that of the reports of sequence cropping of fox tail millet as an early *kharif* crop followed by pigeonpea or sun flower in *rabi* is more remunerative cropping sequence instead of taking only *rabi* crop leaving fallow in *kharif* for Rayalaseema region of Andhra Pradesh [2]. Higher system productivity in terms of bengalgram equivalent yield was also reported by Dixit *et al.* (2011) in a millet-bengalgram crop sequence. This experimental results are also similar to that of the of the finds of Singh and Lal (2013) [3] and from their studies on different crop sequences for their productivity and profitability reported that pearl millet-wheat and pearl millet-potato crop sequences are economically viable next to greengram-potato crop sequence for Gwalior region and this might be due to suitability of millet-pulse crop sequence for their economics and practical feasibility with higher land use and productive efficiency as a whole in vertisols [4].

Conclusion

In evaluation study of different millet-based crop sequences it is concluded that Foxtail millet-Bengal gram crop sequence is suitable and profitable in terms of Net returns and B:C ratio for the vertisols of NSP right canal area under Krishna zone of south coastal Andhra Pradesh.

Application of research: This research results are beneficial for the farmers to select the suitable millet based crop sequences suitable for nsp right canal areas

Research Category:

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Study area / Sample Collection: Regional Agricultural Research Station, Lam Farm, Guntur, 522 034, Andhra Pradesh, India

Cultivar / Variety / Breed name: Blackgram, greengram and bengalgram

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

Ethical Committee Approval Number: Nil

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