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Feasibility of Parallel Cropping of Black Gram with *Pigeon pea* in Central Trait of Uttar Pradesh

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

An experiment was laid out during two consecutive *Kharif* seasons of 2016-2017 and 2017-18 at Soil Conservation and Water Management Farm, C.S. Azad University of Agriculture and Technology, Kanpur. The main objective was to find out the yields of main crop of pigeonpea and black gram and their economic in term of net return. The soil analysis indicated the medium nutrients status. The cropping system i.e., pigeonpea sole, black gram sole and pigeonpea + black gram (1+1) additive series were tested. The total productivity of pigeonpea + black gram was

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maximum (23.53 q/ha) in comparison to pure crop of pigeonpea (17.34 q/ha) and black gram pure (9.44 q/ha). The study of pooled data of economic display that maximum cost of cultivation Rs. 57876/- ha observed under intercropping of pigeonpea + black gram system. The highest gross return Rs. 134024/ha, net return Rs. 76148/ha and BCR 2.32 were also noted under pigeonpea + black gram (1+1) additive series.

Keywords: Additive series; BCR; Feasibility; Net return; Pooled data.

1. INTRODUCTION

In Uttar Pradesh pigeonpea covered 2.85 lakh hectares with total production of 2.72 lakh tones during 2020 [1]. Pigeonpea grown as single crop display in efficient utilization of resources especially the space because of its slow initial growth rate, therefore, cultivation of pigeonpea as a pure crop is reported less profitable due to higher duration and wider spacing. To make the cultivation of pigeonpea more viable, it is necessary to utilize the inter row space through parallel cropping [2]. Parallel cropping with short duration pulses like black gram and green gram and pearl millet, sorghum, finger millet, foxtail millet in pigeonpea may enhance total productivity and also provide early cash flow. The parallel crops also suppress the weed growth in between two rows of pigeonpea. Growing of parallel crops, which produces the maximum cover, reduces sol loss, black gram is most important cover crop for rainy season. The crop gives early and dense ground cover, which generally co-incidence with peak rate of runoff. Parallel cropping is practiced as an insurance of crop failure under rainfed situation. Parallel cropping system utilizes resource efficiency and their productivity is increased [3].

The parallel cropping of black gram in pigeonpea is common practice as it is more remunerative. This parallel cropping services as a kind of insurance against total crop failure due to abnormal rainfall and a safeguards against the natural hazards.

Therefore, productivity and profitability increases through parallel cropping of pigeonpea and black gram, is the subject matter of this manuscript.

2. MATERIALS AND METHODS

The present study was laid out under rainfed condition during two consecutive rainy seasons of 2016-17 and 2017-18 at Soil Conservation and Water Management Farm, C.S. Azad University of Agriculture and Technology, Kanpur. The three treatments were tested i.e., pigeonpea alone planted at 60 cm apart, black gram alone planted at 30 cm apart, pigeonpea + black gram (1+1) planted under additive series. The main crop was pigeonpea, while black gram was planted in the inter spaces of two rows of pigeonpea. The experimental soil was typic eroded Gangetic alluvial representing Kanpur Type-1. The soil was sandy loam, having pH 7.7, organic carbon 0.33%, available N 172.00 kg/ha, available P_2O_5 17.50 kg/ha and available K_2O 183.00 kg/ha, therefore fertility status of plant nutrients was medium. The pH was determined by Electrometric glass electrode method as discussed by Piper [4]. The organic matter was analyzed by Walkley and Black's rapid titration method [5]. The available P_2O_5 and available K_2O were analyzed by Olsen's method and Flame photometric method, respectively [6]. The available N was analyzed by Kjeldahl's method as suggested by Subhiah and Asija [7]. The cultivar Amar (KA-32-1) of pigeonpea, cv. Shekhar-2 (KU-300) of black gram was shown under alone and parallel cropping. The pigeonpea pure, black gram pure and both crops under parallel cropping were fertilized with 20 kg N + 40 kg P_2O_5/ha. The recommended conservation agronomical practices were followed for raising of experimental crops during two experimental seasons. The harvesting of crops was made at complete maturity stage. The treatments were replicated thrice in a split plot design. The data analyzed by standard method as suggested by Cochran and Cox [8]. The economics computed and pooled to draw valid conclusion from the study, is the subject matter of this manuscript.

3. RESULTS AND DISCUSSION

The average data of two years of growth parameters, yield traits, grain yield and economic studies are reported in Tables 1 & 2 and discussed here under appropriate heads-.

Table 1. Growth and yield traits under different treatments

(Pooled data of two years)

S.N.	Treatment	Plant stand at harvest (000/ha)	Plant height at maturity (cm)	Pods/ plants	Seeds/ pod	1000-seed weight (g)
1.	Pigeonpea sole	61.81	200.00	332.90	4.20	101.30
2.	Black gram sole	198.63	39.30	38.54	5.00	35.30
3.	Pigeonpea + black gram (1+1) a.s.	62.14	214.40	343.90	4.60	102.60
	S.E. (d±)	-	3.47	2.27	0.25	1.16
	C.D. 5%	-	9.62	6.30	N.S.	3.48

Table 2. Yield and economic study under different treatments

(Pooled data of two years)

Sr. No.	Treatment	Average yield of main crop (q/ha)	Intercrop yield (q/ha)	Total productivity (q/ha)	Economic study (Rs.//ha)			1000-seed weight (g)
					Cost of cultivation	Gross return	Net return	
1.	Pigeonpea sole	17.34	-	17.34	49861.00	100248.00	50387.00	2.01
2.	Black gram sole	9.44	-	9.44	32966.00	51025.00	18059.00	1.54
3.	Pigeonpea + black gram (1+1) a.s.	19.34	4.19	23.53	57876.00	134024.00	76148.00	2.32
	S.E. (d±)	-	-	-	-	-	-	-
	C.D. 5%	-	-	-	-	-	-	-

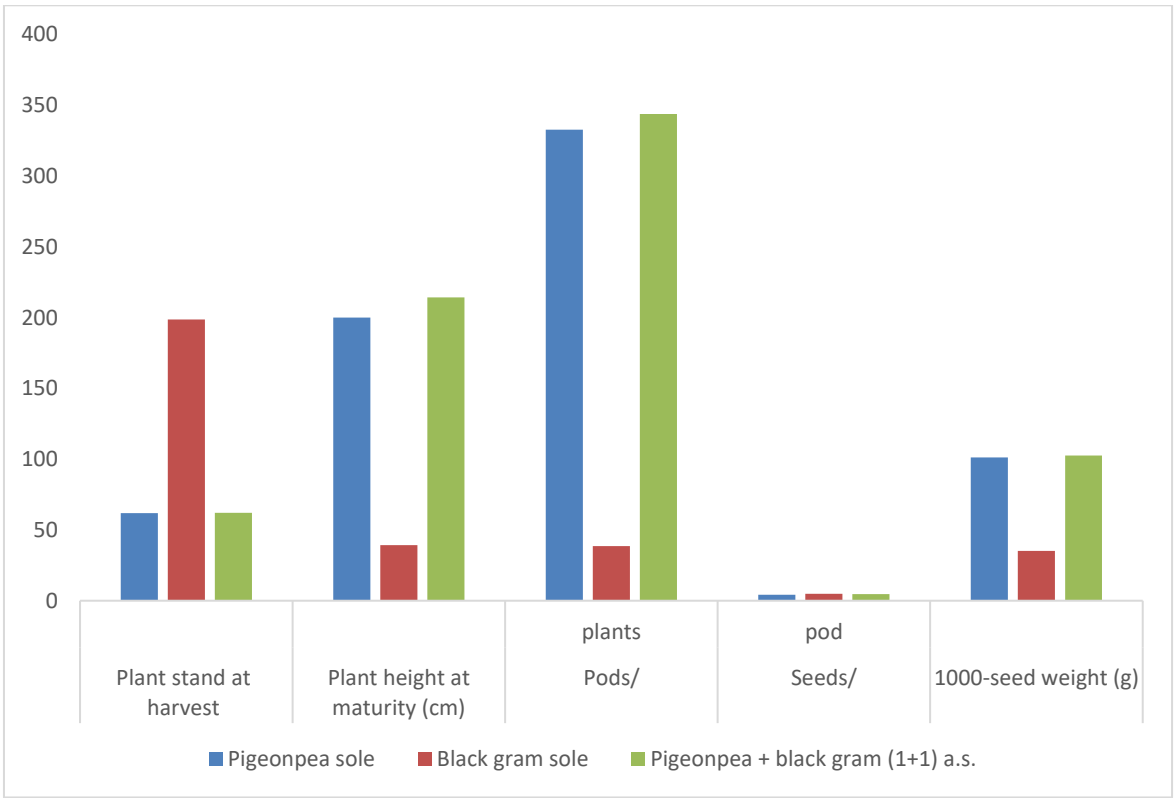

Fig. 1. Growth traits under different treatments

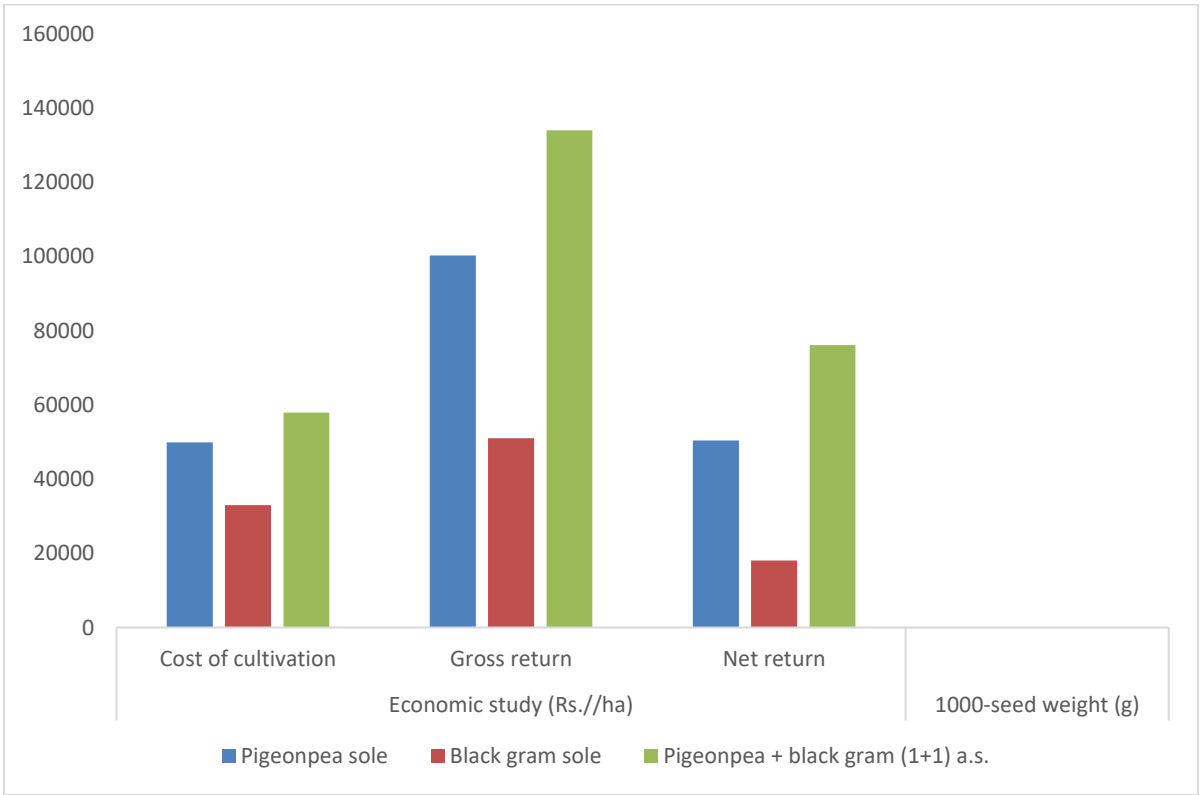

Fig. 2. Yield traits under different treatments

3.1 Pigeonpea Alone v/s Intercrop Pigeonpea-

(A) Growth characters

The effect of cropping systems did not display marked variation in plant stand at harvest of pigeonpea. Thus, uniformity in plant stand for expressing its full potential regarding growth and development of crop. Cropping systems significantly affected plant height of pigeonpea crop measured at maturity stage. Pigeonpea + black gram (1+1) additive series produced significantly taller plant over pigeonpea sole crop. The pigeonpea utilized nitrogen plant nutrients fixed by rahizobium available in the root nodules of black gram. These findings are commensurable to results of Nandhini et al. [9] and Sujath and Babalad [10].

(B) Yield contributing characters

The yield traits of pigeonpea noted in term of pods/plant, seeds/pod and 100-seed weight, which was higher under pigeonpea + black gram (1+1) additive planting system compared to pigeonpea sole. This was due to pigeonpea benefited by environmental nitrogen fixed by intercrop black gram.

(C) Grain yield of pigeonpea

Perusal of dta make it clear that the highest grain yield of pigeonpea was found in pigeonpea + black gram parallel cropping system (19.34 q/ha) followed by sole cropping of pigeonpea (17.34 q/ha)/ Therefore, the pigeonpea grain yield was higher under pigeonpea + black gram parallel cropping by a margin of 2.0 q/ha or 10.34%. The considerable improvement of yield contributing traits under pigeonpea + black gram system, supported to highest grain yield of pigeonpea in cropping system of pigeopea + black gram (1+1) planting system.

(D) Grain yield of black gram:

The data reveal that cropping system showed marked variation in grain yield of black gram. The seed yield of black gram intercropped reduced in association with pigeonpea as compared to sole crop of black gram. The considerable improvement in pods/plants, seeds/pod and 1000-seed weight in sole crop of black gram, supported to the higher grain yield under sole cropping of black gram. The higher plant stand of pure black gram also responsible for higher yield of black gram pure.

(E) Economic study:

The highest cost of cultivation was noted under pigeopea + black gram (1+1) additive series by Rs. 57876.00/ha. It might be attributed to total population adjustment under both enterprises and their total input requirements. The highest gross return (Rs. 76148.00/ha) and BCR (1:2.32) were observed under pigeonpea + black gram parallel cropping. It may be due to higher total productivity of planting system. These results are in agreement with those reported by Reddy et al. [11], Dudhade et al. [12], Sharma et al. [13], Kumawat et al. [14] and Yadav et al. [15,16].

4. CONCLUSION AND RECOMMENDATION

Since, the cropping system of pigeonpea + black gram gave net return by Rs. 76148/ha, therefore, farm house holds residing in the vicinity of rainfed area may be suggested for adoption of parallel cropping of pigeonpea + black gram for higher total productivity and profitability and harvest the fruits of newly generated technology.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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