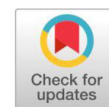


## A Research on Redgram as Alternate Crop to Cotton in Rainfed Light Soils

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### Abstract

*An on-farm trial entitled with Redgram as an alternate crop to cotton in rainfed light soils was conducted by KVK, Palem, Nagarkurnool district. During Kharif 2018-19 to 2020-21 three years to find out the best suitable crop in rainfed light soils of nagarkurnool district. Here the treatments are Redgram crop cultivation under demonstration and cotton crop cultivation as under farmers' practice. The results proved that every aspect of the crop package Redgram showed lower costs and more returns and cotton have shown higher costs and lower returns. Package-wise results Redgram and cotton 3 years averages of costs are like Land preparation Rs. 6417 Rs. 8958, Seed cost Rs. 917, 5117, fertilizers Rs. 3875, 11854, inter cultivation Rs.5833, Rs.10833, Weed management Rs. 3333, Rs.5167, plant protection Rs. 6416, Rs.18996, Harvesting Rs. 5000, Rs.19333, yield 13.79q, 18.63q, Gross income Rs. 80349 Rs. 100944, cost of cultivation Rs. 33433 Rs. 80208, net income Rs. 46199, Rs. 22403, benefit-cost ratio Rs.5.94 Rs.3.19. Hence Redgram crop cultivation proved itself better when we compared it with cotton crop cultivation in rainfed light soils.*

**Keywords:** Redgram, Cotton, Alternate crop, rainfed soils and Economics.

### Introduction

Indian agricultural system mainly depends on rainfed agriculture only. Net Cultivated area in India is nearly 140 M ha out of this rainfed area is 70 M ha in percentage 50% area under rainfed conditions. It contributes 40 percent of the total food production and 60% of the total agricultural GDP.

India's population will be expected to touch 1.68 billion by 2030 and the pulses requirement will be 32 million tonnes with the required annual growth rate of 4.2% [8]. Globally, India is the largest producer and consumer of pulses accounting for about 25% of production, 27% of consumption, and 34% of food use [5]. Pulses are an important group of food crops considered a protein source for both human as well as

animal nutrition and they play a vital role in national food and nutritional security [2].

Redgram is considered as an important food legume that contains 20-22 % protein. So, it is a principal crop in South India to meet out the protein requirement of vegetarian people and hence referred to as 'poor man's meat'. Redgram can fix around 40 kg ha<sup>-1</sup> N [4]. In India Redgram [*Cajanus cajan* (L.) Millsp] is commonly known as Tur or Arhar and it is the second most important pulse crop in the country next to chickpea. The deep root system of Redgram breaks the hard pan of the soil hence it is known as a "biological plough". Redgram can withstand extreme drought condition and is an important rainfed pulse crop in South India. Though India contributes more than 90% of the world's Redgram cultivation area and production, India imports around 3.09 million tonnes of Redgram and it contributes 6.60% share in India's import basket during 2018. This is mainly because of the low productivity of Redgram in India [8].

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Redgram is largely cultivated in rainfed conditions and farmers' employ faulty agro techniques is a reason for low productivity in India. Timely sowing of crops,

optimum plant population, and suitable agronomic practices are the main key factors to determine crop growth and enhance the yield of the rainfed crop. Rainfall is the prime source for water resources in rainfed farming. Sowing immediately after the receipt of rainfall leads to difficulties in sowing operation and reduces the availability of soil moisture during the crop growth period. To avoid these difficulties pre-monsoon sowing technique is adopted for rainfed farming to enhance crop growth and yield [1].

## Materials and methods

On-farm trial entitled Redgram as an alternate crop to cotton in rainfed light soils was conducted by KVK, Palem, Nagarkurnool district. During Kharif 2018-19 to 2020-21 three years in Nandivaddeman, Peddapur, Khanapur, and Yadireddypally villages in 18 locations of nagarkurnool district. Redgram crop is situated in rainfed light soils where the average annual rainfall was 650 mm. Redgram crop was sown under square planting method and spacing for the row to plant was equal or same distance viz., 90x90 cm. the recommended seed rate was followed in sowing time i.e. 3kg per one acre. Seed treatment was done before sowing Soaking seeds for 3 h in 100 ppm ZnSO<sub>4</sub>, (10g/100 lit of water) at 1/3 volume and quickly air drying in shade to their original moisture content. Slurry treated the seeds with carbendazim 75% WP @ 2 g dissolved in 5 ml of water per kg of seeds and air-dried. Sowings were completed every year in June 15<sup>th</sup> to July 15<sup>th</sup> before the sowing window gets completed under optimum soil moisture conditions. Seeds were placed in the inter-junctions of markings. Pre-emergence herbicide application with pendimethalin 1.2 to 1.5 liter per acre spray in 200 litres of water as per the recommended practice. Post-emergence herbicides against broad-leaved weeds imazethapyr 300ml/acre. If the grasses are more turga super 400ml/acre or propaquizafop 250ml. Fertilizers applied as basal application 8-10 kg nitrogen, Single super phosphate 100 kg and murate of potash 15kg to meet the initial nutrient requirement. Life-saving irrigation are two one is at pre-flowering and pod development stages. Need-based application of insecticides and fungicides as per the recommendation. Harvested the crop at 135-140 days when the pods are turns brown with help of a harvester. Sold the produce after seed dried completely (8-10 % seed moisture). Cotton crop was also grown as per the farmer's knowledge besides to the redgram crop and it is taken into consideration as farmers practice.

## Results and Discussion

Redgram can be grown on a wide range from Sandy loams to clay loams. The crop performs well on fertile well-drained loamy soils. Saline, Alkaline, and waterlogged are not suitable. Cultivation of redgram crop was proved better when we compared with cotton crop in rainfed light soils in terms of costs. Redgram sowing time depends upon the duration of variety and rainfall pattern of the region, early sowings are always better. Sowings should be planned in such a way that flowering and pod formation should not coincide with the peak rainy period. Redgram is a quantitative short-day flowering response plant i.e. the onset of flowering is hastened as day length shortens. It is grown throughout the tropical, sub-tropical & warmer regions of the world between 30°N & 35° S latitude. It tolerates heat and drought. It prefers moist and warm climate during the vegetative period and the cool and dry period during the reproductive stage. It is susceptible to frost. The cloudy weather and excessive rainfall during flowering damage the crop to a great extent. Kharif sowing time June-July, The sowing time depends upon the duration of variety and rainfall pattern of the region, early sowings are always better. Sowings should be planned in such a way that flowering and pod formation should not coincide with the peak rainy period. Seeds are sown behind the plough or with the use of seed drills. [9] also reported that lower adoption of rhizobium culture and low availability of improved seeds was the major constraints in the production of pulses in the Ferozpur and Ludhiana district of Punjab. [3] also reported that the major constraints in raising the productivity of pulses were the non-availability of improved seeds in time, improved implements, chemical and bio-fertilizers, pesticides, plant protection appliances, befitting soil type to the advocated crops and timely guidance from village extension workers. Plant population depends on: Sowing time: For Kharif, plant population is less than Rabi because of more canopy growth. Fertility status of soil: Higher plant population can be used under fertile soils than on infertile soils. Rainfall pattern: In regions which are having well-distributed rainfall, maintain high plant population than areas with low rainfall. Varieties: Variety with less branching requires higher plant population. Duration of the crop: Longer duration varieties require less plant population because of more canopy development. Land preparation redgram needs only two finer operations but cotton crop needs three finer operations to form the ideal seed bed and to get

**Table 1:** Crop wise cost of cultivation of Redgram and Cotton and averages 3 years.

Practice	Redgram Rs. /ha <sup>-1</sup>				Cotton Rs. /ha <sup>-1</sup>			
	2018-19	2019-20	2020-21	Average	2018-19	2019-20	2020-21	Average
Land preparation	8750	5000	5500	6417	11250	7500	8125	8958
Seed rate (kg)	7.5	7.5	7.5	7.5	2.0	2.0	2.0	2.0
Seed cost	825	825	825	825	4725	5250	5375	5117
Fertilizers	3750	3750	4125	3875	10313	12500	12750	11854
Inter cultivation	2500	7500	7500	5833	10000	11250	11250	10833
Weed management	3750	3000	3250	3333	7750	3750	4000	5167
Plant protection	3750	7500	8000	6417	11088	22500	23250	18946
Harvesting	2500	6250	6250	5000	18000	20000	20000	19333
Yield (q) / ha <sup>-1</sup>	12.5	14.9	14.0	13.8	18.2	20.3	17.5	18.6
Gross income	70773	86275	84000	80349	88945	112388	101500	100944
Cost of cultivation	31100	33750	35450	33433	73125	82750	84750	80208
Net income	39672	50375	48550	46199	20820	29638	16750	22403
B:C ratio	5.70	6.38	5.75	5.94	3.2	3.38	3.00	3.19

a good germination percentage so that redgram has fewer cost Rs. 6417/-ha<sup>-1</sup> towards land preparation and the cotton crop has needed more costs for seed bed Rs. 8958/- ha<sup>-1</sup>. Redgram Seed treatment with fungicides like Bavistin 1g/kg seed captan or Thiram @ 2.5 g/kg before sowing effectively controls fungi and reduces incidence of both seed and soil-borne fungi. Redgram Seed treatment with Rhizobium culture can increase the yield upto 20-30%. Seed rate needed 7.5 kg/ha<sup>-1</sup> with a spacing 90cm x 90cm Rs. 975/- ha<sup>-1</sup> and the seed cost with the cotton crop is 2kg/ha<sup>-1</sup> Rs. 5117/- ha<sup>-1</sup> with a spacing 90 x 90 cm. The higher plant height may be because of competition for light, water and space which resulted in increased plant height of crops in closer spacing as compared to wider spacing [7]. Nitrogen 20kg/ha- long & Medium duration varieties, phosphorous 50 kg P2O5/ha for phosphorous deficient soils at sowing, Potassium 20kg K2O/ha for potassium deficient soils by placement at sowing fertilizer cost also differentiating each other vize., redgram Rs. 3875/- ha<sup>-1</sup> but cotton Rs. 11854/- ha<sup>-1</sup>. The critical periods for Irrigation are the flower-initiation and pod-filling stages. Intensive cropping of Pigeonpea can also be achieved under tube well irrigation, arising at the highest production of 4 tons/ha. Redgram grown in Kharif does not require any irrigation. Inter cultivation was done mainly for controlling the weeds as well as to create dust mulch to reduce the water losses through evaporation mean while redgram crop needs two inter cultivation practices and it cost around Rs.5833/- ha<sup>-1</sup> whereas in cotton Rs.10833/- ha<sup>-1</sup> because cotton needs three times inter cultivations. Pigeonpea is a slow-growing crop during the first 6-8 weeks, and 2 harrowings during this period would be adequate to check

weed growth. The herbicides recommended are pre-emergence application of Alachlor (Lasso) @ 1.5 kg a.i/ha, Fluchloralin (Basalin) @ 1.5kg a.i/ha. Critical stages of crop weed competition for redgram were 35-40 days mean while cotton was 50 days. Redgram needs only Rs. 3333/- ha<sup>-1</sup> for pre and post-emergence weedicides as well as hand weeding, cotton crop has to maintain a weed free up to 50 days it may needs more attention and investment towards weed control needs Rs. 5167/- ha<sup>-1</sup>. Plant protection throughout the season against pod fly, pod borers, wilt disease, and other need-based protection measures of redgram incurred Rs. 6417/- ha<sup>-1</sup> when compared to cotton Rs.18946/- ha<sup>-1</sup> because cotton needs more curative measures against aphids, white flies, borers and all disease-related control measures. Redgram has only one-time opportunity for crop harvesting to get the yield its costs nearly 14.95% of the total cost of cultivation Rs. 33433/- ha<sup>-1</sup> but whereas cotton needs 2 to 3 pickings to get the maximum yield and labour shortage also becoming a major problem. Cotton picking costs around 24.1% of the total cost of cultivation Rs. 80208/- ha<sup>-1</sup>. When we saw the yields of both the crops Redgram 13.8 q/ha<sup>-1</sup> and cotton was 18.6 q/ha<sup>-1</sup> here yields were recorded in redgram when compared to cotton similarly in the aspects of gross returns, cost of cultivation, net income of Redgram, and Cotton. The cost of cultivation of red gram crops is the total of costs incurred on various inputs that are used in different operations. The profitability of any enterprise depends upon income-generating capacity and cost structure [6]. Benefit-cost ration was indicating that with the cultivation of Redgram has more B: C ratio of Rs. 5.94 compared to the cotton Rs. 3.19.

## References

- [1.] Ammaiyappan, S., Sakthivel, A., Veeramani, P., Kannan. (2019). Effect of Improved Agronomic Approaches on Growth and Yield of Redgram [*Cajanus cajan* (L.) Millsp] under Rainfed Ecosystem. *Legume Research- An International Journal*, 4417: (4):1-6.
- [2.] Bhat, R. and Karim, A.A. (2009). Exploring the nutritional potential of wild and underutilized legumes. *Comprehensive Reviews in Food Science and Food Safety*. 8(4): 305-331.
- [3.] Desai, B.R.; K.A. Giaraise and R.P. Patil. 1998. A study on constraints faced by contact farmers in the adoption of new technology. *Agricultural Extension Review*, 18: 15-16.
- [4.] Domoguen, R.L., Saxena, K.B., Mula, M.G., Sugui, F. and Dar, W.D. (2010). The multiple uses of pigeon pea.
- [5.] Pooniya, V., Choudhary, A.K., Dass, A., Bana, R.S., Rana, K.S., Rana, D.S. and Puniya, M. M. (2015). Improved crop management practices for sustainable pulse production: An Indian perspective. *Indian Journal of Agricultural Sciences*. 85(6): 747-758.
- [6.] Renuka, R. Vijayakumari, MD. Ali Baba and A. Meena. (2019). Economic analysis of Redgram cultivation in Gulbarga District of Karnataka State. *The J. Res. PJTSAU* 47(2)42-45.
- [7.] Rasul, F, Cheema, M.A., Sattar, A., Saleem, M.F. and Wahid, M.A. (2012). Evaluating the performance of three mungbean varieties grown under varying inter-row spacing. *Journal of Animal and Plant Science*. 22(4): 1030-1035.
- [8.] Sarkar, S., Panda, K. Yadav and P. Kandasamy. (2018). Pigeon pea (*Cajanus cajan*) an important food legume in india
- [9.] Usha, Tuteja. 2000. Economics of pulses production and identification of constraints in raising production in Punjab. *Research Study Agricultural Economics Research Centre, University of Delhi*. 2000; (2000/1): 99.