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Yield performance and economics of greengram cultivars in coastal cauvery Deltaic zone, Tamil Nadu

G B Sudhagar Rao[1*], R Rex Immanuel[1], S Ramesh[1], T Suthin Raj[2]
[1] Department of Agronomy, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamil Nadu, India
[2] Department of Plant Pathology, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamil Nadu, India

Abstract
Field experiments were conducted to evaluate the greengram varieties in Cauvery deltaic zone of Tamil Nadu during the rice fallow season of 2019 at dept. of agronomy, Experimental Farm, Annamalai University Annamalainagar, Tamil Nadu, India. The experiment was laid out in Randomized Block Design with three replications (RBD). The treatments consisted of eight varieties *viz.*, K1 (T1), Paiyur 1 (T2), Co2 (T3), VBN 1 (T4), KM 2 (T5), ADT 3 (T6), ADT 2 (T7) and KM 1 (T8). The results of the study clearly showed that the greengram variety KM 2 recorded higher growth and yield attributes and yield than other varieties tested. It was followed by the variety ADT 2. The least growth and yield components and yield were registered by the variety ADT3 during the rice fallow season.

Keywords: greengram, economics, varieties, yield

Introduction
Greengram *(Vigna radiata* L.) is the third most important pulse crop grown in India next to blackgram and redgram. It is favourable pulse crops since it thrives better in all seasons either as sole or intercrop or fallow crop. Pulses are the main sources of protein in the Indian diet where majority of the population comes under vegetarian category. The per capita availability of pulses decreased from 69 g in 1962 to 37 g in 2008 as against the ICMR recommended pulses intake of 50 g capita-1 day-1 (Masood Ali and Shiv Kumar, 2008) [2]. In India, greengram is grown over an area of 3.43 million hectares with a production of 1.52 million tonnes and productivity of 510 kg ha^{-1}. In Tamil Nadu, greengram is cultivated in about 1.71 lakh hectares with a production of 0.57 lakh tonnes and a productivity of 336 kg ha^{-1}. The rice fallow area in Tamil Nadu is 4.61 lakh ha^{-1}, out of this, pulses *viz.*, blackgram and greengram are grown in two lakh hectares. However, the productivity of greengram in India is too lower than the world's average. In order to break the barriers of stagnant production of pulses, there is a need to evolve suitable high yielding variety for Cauvery deltaic zone of Tamil Nadu.

Materials and Method
Field experiments were conducted during the rice fallow season of 2019 (January-April) at dept. of agronomy, Experimental Farm, Annamalai University Annamalainagar, Tamil Nadu. The treatments consisted of eight varieties *viz.*, K 1 (T1), Paiyur 1 (T2), Co 2 (T3), VBN1 (T4), KM 2 (T5), ADT 3 (T6), ADT 2 (T7) and KM 1(T8). The experiment was laid out in RBD with three replications. The soil of the experimental site was clay loam in texture, having pH 7.9, low in available nitrogen, medium in available phosphorus and high in available potassium. A recommended fertilizer dose at 25:50:0 kg of N: P_2O_5: K_2O respectively was applied basally in all the plots. Urea and single super phosphate were used as source of N and P, respectively. Irrigation was given as and when necessary. The growth and yield attributes and yield were recorded for evaluating the different greengram varieties.

Results and Discussion
Growth components
Among the tested varieties, KM 2 recorded the highest plant height, leaf area index and dry matter production during the rice fallow season. The reason may be attributed to the genetic variability and varietal difference and environmental adaptability. The similar results were also registered by (Punam Singh Yadav and Roopa Lavanya, 2011) [5] and (Dash and Rautaray 2017) [3]. The increased plant height and leaf area index might be also due to better light interception and photosynthetic rate. KM 2 yield improvement through increasing the physiological, biochemical attributes on 30 and 45 days after sowing. The data on crop growth components as reported in Table 1 indicated that the tallest plants height, leaf area index and dry matter production were recorded in variety KM 2.

Yield components
The greengram variety KM 2 significantly recorded higher number of pods plant-1, pod length and number of seeds pod-1 which might be due to the enhanced sink activity as a consequence of increased availability of assimilates from the source. This is in agreement with the report of Baburam Singh and Tejeswar Rao (2008) [1] and Sudhagar Rao *et al.* (2018) [1]. The appreciable increment of growth components might have positively reflected on the yield components.

Grain and haulm yield
The seed yield of different high yielding varieties of green gram recorded in Table-2. Grain and haulm yield was significantly influenced by different greengram varieties during rice fallow season. The variety KM 2 recorded the highest grain yield of 936 kg ha-1 and haulm yield of 1710

kg ha-1. The trend of haulm yield of different was almost similar with seed yield. Higher haulm yields were obtained from variety KM 2 owing to high dry matter accumulation whereas the others verities (Samant, 2014) [7] and Sudhagar Rao *et al*. (2019) [10].

This might be due to enhanced growth and yield components such as LAI, DMP, and number of pods plant-1, pod length and number of seeds pod-1 which ultimately resulted in higher yield as compared to other varieties. Similar results were earlier reported by Vaithilingam *et al*. (1995) [13], Saraswati, *et al*. (2004) [8] and Rathodand Gawande (2014) [6].

Economics

The economics of different green gram varieties have been presented in Table-3.

The results of economic analysis of green gram varieties revealed that the gross expenditure in case of KM 2 was higher than other variety. Among the greengram varieties, KM2 registered the highest return of Rs 28545 ha^{-1} and return per rupee invested of Rs 4.21 due higher grain and haulm yields than other varieties. The present results are in confirmity with findings of Lalit *et al*. (2014) [4] and Sudhagar Rao and Wahab (2012) [12]. The results from the trial have conclusively proved that the yield of KM 2 was significantly higher than other varieties with recommended agronomical package and practices. Thus the existing local variety may be replaced with high yielding variety KM 2.

Table 1: Growth components of different greengram varieties at harvest

Treatments	Plant height (cm)	LAI	DMP (Kg/ha)
T_1– K 1	51.9	3.42	2297
T_2– Paiyur 1	54.1	3.96	2450
T_3 – CO 2	49.8	2.99	2152
T_4– VBN	57.2	4.41	2622
T_5– KM 2	66.2	5.42	2986
T_6– ADT 3	45.4	2.12	1768
T_7– ADT 2	61.2	4.83	2779
T_8 – KM 1	47.6	2.58	1985
SE_m	0.96	0.19	55.3
CD (p=0.05)	2.08	0.39	116.4

Table 2: Yield components, grain and haulm yield of different greengram varieties

Treatments	No. pods plant^{-1}	Pod length (cm)	No. seeds pod^{-1}	Grain yield (Kg ha^{-1})	Haulm yield (Kg ha^{-1})
T_1– K 1	13.12	6.03	6.85	675	1278
T_2– Paiyur 1	13.69	6.29	7.11	733	1384
T_3 – CO 2	12.50	5.74	6.58	607	1156
T_4– VBN	14.14	6.58	7.39	790	1490
T_5– KM 2	15.98	7.21	8.15	936	1710
T_6– ADT 3	10.92	5.10	6.06	469	916
T_7– ADT 2	14.73	6.85	7.67	850	1596
T_8 – KM 1	11.56	5.47	6.32	541	1038
SE_m	0.26	0.09	0.08	25	51
CD (p=0.05)	0.54	0.20	0.19	52	103

Table 3: Economics of different greengram varieties

Treatments	Grain yield (Kg ha^{-1})	Cost of cultivation (Rs. Ha^{-1})	Gross return (Rs. Ha^{-1})	Net return (Rs. Ha^{-1})	Return rupee^{-1} invested
T_1– K 1	675	8725	27000	18275	3.09
T_2– Paiyur 1	733	8780	29320	20540	3.33
T_3 – CO 2	607	8700	24280	15580	2.79
T_4– VBN	790	8890	31600	22710	3.55
T_5– KM 2	936	8895	37440	28545	4.21
T_6– ADT 3	469	8510	18760	10250	2.20
T_7– ADT 2	850	8990	34000	25010	3.78
T_8 – KM 1	541	8725	21640	12915	2.48

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