Journal of the Andaman Science Association Vol. 19(2):215 - 218 (2014)
ISSN 0970 - 4183, Printed in India

FARMER'S PARTICIPATORY EVALUATION OF PULSE VARIETIES IN FIELD OF BAY ISLAND

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ABSTRACT

Farmer's participatory evaluation of varieties employs the active participation of farmers in breeding programmes, and will usually involve farmers selecting genotypes from genetically variable material. Field experiments were conducted in participatory mode during 2008 - 09 to 2012 - 13 in South Andaman district of Andaman and Nicobar Islands in Randomized Block Design in 5 farmers field (replications) in order to assess the suitability of Green gram and Black gram under residual moisture in rice fallow under island ecosystem. Five varieties of Blackgram viz. 'T9', 'PDV1', 'TMV1', 'Naveen' and 'Co 5' and six varieties of Green gram viz., 'T44', 'P 105', 'PDM 54', 'Co 5', 'Narendra Moong' and 'PDM 11' were evaluated. Among the varieties evaluated, 'T9' (0.94 t ha^{-1}) and 'TMV1' (0.95 t ha^{-1}) of Blackgram and 'PDM54' (0.86 t ha^{-1}) and 'T44' (0.85 t ha^{-1}) of Green gram recorded higher grain yields, net returns, energy efficiency and lower specific energy.

Key Words: Blackgram, Greengram, farmers participatory evaluation

Andaman and Nicobar group of Islands are endowed with a true maritime climate year around with least variation between maximum (30.1° C) and minimum (23.1°C) temperatures. Temperatures between the month of May and December are moderated by rain. The maximum temperatures are experienced during the dry season when evapo - transpiration losses are found to be highest. Since these islands are blessed with the influence of both the South - West and North - East monsoons they receive rain from April to December. The mean annual precipitation is around 3100 mm unevenly distributed throughout the year. Presence of light textured soil in islands leads to short time availability of moisture for rice fallow crops. Indian diet changed from grains to grams and greens which is also one of the factors for having higher demand of pulses. Around 7500 ha of rice fallow area in this tropical islands can be brought under ultra short and short duration pulses viz., black - gram and green - gram in the residual moisture. In order to assess the potentiality of pulses in residual moisture, participatory evaluation of pulses is essential. Crop improvement research has made a significant contribution in the last 5 decades through the development and release of a large number of varieties in all important crops for general cultivation (Gowda *et al.*, 2000). Participatory varietal selection (PVS) is the selection by farmers on their own fields of finished or near - finished products from plant breeding programmes. These include released cultivars, varieties in advanced stages of testing, and well characterized material such as advanced non - segregating lines in inbreeding crops, or advanced populations in outbreeding crops. Participatory varietal selection to identify preferred cultivars has three phases: identifying farmers' needs; searching for suitable material to test with farmers; and experimentation on farmers' fields. Once identified, the seed of farmer - preferred cultivars needs to be rapidly and cost - effectively supplied to farmers. Choosing from amongst released cultivars has the advantage that any NGO or GO can, in principle, readily procure seeds in sufficient quantities for testing with farmers. If they are identified as being farmer acceptable it should be much easier, than is the case for pre - release or breeder's lines, to provide large quantities of seed to the farmers with little delay. However, to enlarge the basket of choices and exploit recent outputs from plant breeding research, pre - release cultivars were also included in the search process. In all of the crops studied, promising one were identified as being suitable for testing with farmers. Some of these pre

- release cultivars would be defined by others as advanced material. Keeping this in view , field experiments were conducted in participatory mode to assess the suitability of Green gram and Black gram under residual moisture in rice fallow under island ecosystem.

MATERIALS AND METHODS

The experiment on evaluation of Blackgram and Greengram varieties were conducted in participatory mode in the farmer's field in order to assess the suitability of these crops under residual moisture and to identify the best and short duration varieties for the rice fallow crops in Andaman and Nicobar Islands. The basic unit of replication is a participating farmer, with each farmer allocated a single introduced variety. In each village each cultivar was replicated equally. The next unit of replication is the village. The experiment was conducted in 5 farmers field in the Diglipur cluster of villages in South Andaman district having sandy clay loam soil with average pH of 6.2 to 6.7, 0.52 to 0.58 % organic carbon, 272 to 298 kg of available N, 16 to 19 kg of available P and 92 to 108 kg of Potassium in different years of evaluation. Each participating farmer was randomly assigned a single variety - ideally, farmers are asked to remove a bag of seed from a sack. Sufficient seed was provided for plot sizes that are large, but not too large to present an undue risk for the farmer. Only one variety was given to each farmer to simplify the design of the trial and reduce planting errors. Farmers were asked not to change their normal cultural practices in any way. The trial was not designed to test a package, but to test a single component, the new cultivar. The only exception to unchanged cultural practices was to change sowing rate when the seed size of the new variety differs greatly from the local.

The participatory mode of evaluation was continued for five years from 2008 - 09 to 2012 - 13 . In Blackgram, five varieties viz., 'T9', 'PDV1', 'TMV1', 'Naveen' and 'CO 5' were evaluated in 5 farmers holding in the Guptapara cluster of villages and six varieties of Greengram varieties viz., 'T44', 'P 105', 'PDM 54', 'CO 5', 'Narendra Moong' and 'PDM 11' were evaluated in another 5 farmers field of the same village. The experiment was laid out in Randomized Block Design with 5 replications (farmers). Required inputs in terms of seed and fertilizers were supplied from experimental charges, where as manpower required for sowing, soil preparation, mulching and harvesting were provided by farmers. Recommended package of practice were adopted for both the crops.

Yield data was obtained in a participatory mode. The area of the plots was measured and it ranged from 0.40 to 0.45 hectares. Farmers, after harvesting the plots separately, measured the yield obtained from each plot. Data were obtained from farmers on the yield from their plots. The area of land under cultivation of each crop was extrapolated from the amount of seed sown (although the preferred method is to measure the area directly). Yield of the different varieties were recorded during different years and pooled analysis were carried out to identify the best varieties for rice fallow Greengram and Blackgram. Net Returns and B: C ratios were also worked out. Energy efficiency and specific energy were calculated using the formula prescribe by Mittal *et al* (1985).

RESULTS AND DISCUSSION

Yield

Blackgram (*Phaseolus mungo* L.)**:** Black gram was found to be the most important pulse crop in the cropping system. The crop is grown both as a mixed crop or an inter - crop and as a sole crop on many fields with poor soil fertility that have stony hilly patches. Yield of Blackgram was significantly influenced by different varieties (Table1). Among the varieties evaluated, 'T9' registered significantly higher yield (0.95 t ha^{-1}) which is on par with 'TMV1' (0.94 t ha^{-1}). Black gram is grown throughout South East Asia for its protein rich seeds. The variety T9 is a short duration, early maturing, erect type with very high yield and wide adaptability, but the seeds remain dormant for 3 - 4 months. Dormancy is due to hard seed coats that prevent water imbibition in freshly harvested seeds. Dormancy can be broken by mechanical scarification of the seed coat, treatment with concentrated sulphuric acid for 8 minutes, or heat treatment at 70°C for 24 hours. However, it was felt desirable to induce mutation for non - dormancy in this variety without altering its otherwise desirable genotype. The other

varieties namely 'PDV1', 'Naveen' and 'CO5' registered significantly lower yield compared to 'T9' and 'TMV1' under farmers field conditions. Significantly higher yield registered by 'T9' and 'TMV1' variety might be due to the tolerance of these varieties for drought in the later stages and short duration (< 80 days).

Greengram *(Vigna radiata):* Pooled analysis of 5 years participatory evaluation of Greengram varieties revealed the significant influence of varieties on yield under residual moisture. Among the varieties evaluated, 'PDM 54' registered significantly higher yield of 0.86 t ha^{-1} which is statistically on par with 'T44' (0.85 t ha^{-1}). 'CO 5' also registered a yield of 0.80 t ha^{-1} compared to other varieties. Branching habit, of 'PDM54' and 'T44' coupled with short duration (< 75 days) and stress tolerance mechanism of these varieties could be attributed to increased yield. Abdalla and Singh (2004) also confirm the findings.

Economics

Among the Blackgram varieties, 'T9' registered higher net return of Rs. 19250.00 /ha, with B: C ratio of 4.24 followed by 'TMV1' registering the net return of Rs. 19150.00 with B: C ratio of 4.25. Higher net returns and B: C ratio of 'T9' and 'TMV1' is attributed to higher grain yield recorded by these varieties. Similarly, in Greengram varieties 'PDM 54' and 'T44' recorded higher net returns and B: C ratio (Rs. 17175.00 and Rs. 16850.00 per ha. and 3.81 and 3.74 respectively). Higher yield (farmers field conditions) registered by these varieties are attributed for higher net returns and B: C ratio. This is in line with the findings of Singh and Pareek (2003). In general, higher net returns and B: C ratio of Blackgram and Greengram in Andaman and Nicobar Islands are attributed to higher value of finished products in the market.

Table 1. Yield and Economics of Black and Greengram under participatory evaluation (pooled over 5 years i.e. 2008 - 09 to 2012 - 13)

Crop / variety	Yield (t/ha)	Net Return (Rs./ha)	B:C Ratio
Blackgram			
T9	0.95	19250	4.24
PDV1	0.87	17150	3.81
TMV1	0.94	19150	4.25
Naveen	0.85	16750	3.72
CO 5	0.77	14675	3.26
CD (P=0.05)	**0.02**	-	-
Greengram			
T 44	0.85	16850	3.74
P 105	0.75	14250	3.16
PDM 54	0.86	17175	3.81
CO 5	0.80	15525	3.45
Narendra Moong	0.82	16100	3.57
PDM 11	0.73	13850	3.07
CD (P=0.05)	**0.03**	-	-

Energetics

Energetic analysis of Blackgram and Greengram indicated that, input energy (748.10 MJ) was consumed by both the crops, as all, the operations and input was similar for both the crops. 'T9' variety of Blackgram recorded higher out put energy of 13965 MJ (Table2) followed by 'TMV1'. Energy efficiency was also higher with 'T9' inferring efficient conversion of input energy into output energy. Specific energy is lower for 'T9' and 'TMV1' (0.78 and 0.79 MJ / kg) indicating that less energy is required by 'T9' and 'TMV1' varieties to produce one kg of grains. Better performance of 'T9' and 'TMV1' varieties in terms of energy are attributed through production of more economic biomass. Like Blackgram, all the varieties of Greengram also required 748.10 MJ as input energy. In terms of output energy, 'PDM 54' and 'T44' recorded 12745 MJ and 12554 MJ of output energy compared to other varieties. 'PDM 54' recorded energy efficiency of 17.03 followed by 'T44' (16.78). 'PDM 54' and 'T44' required lower specific energy (0.86 and 0.87 MJ / kg) indicating that these varieties required less energy to produce one kg of grain. Similar findings were also earlier reported by Singh and Singh (2004). Thus, it can be concluded that, 'T9' and 'TMV1' variety of Blackgram and 'PDM 54' and 'T44' variety of Greengram can be recommended for cultivation in rice fallow residual moisture under Islands ecosystem to realize higher productivity, profitability and energetics.

Table 2. Energetics of Blackgram and Greengram under participatory evaluation in farmer's field (pooled over 5 years i.e. 2008 - 09 to 2012 - 13)

Crop / variety	Input Energy (MJ)	Output Energy (MJ)	Energy Efficiency	Specific Energy (MJ/kg)
Blackgram				
T9	748.10	13965	18.60	0.78
PDV1	748.10	12730	17.01	0.86
TMV1	748.10	13906	18.58	0.79
Naveen	748.10	12495	16.70	0.88
CO 5	748.10	11274	15.07	0.97
Greengram				
T 44	748.10	12554	16.78	0.87
P 105	748.10	11025	14.73	0.99
PDM 54	748.10	12745	17.03	0.86
CO 5	748.10	11775	15.74	0.93
Narendra Moong	748.10	12113	16.19	0.91
PDM 11	748.10	10790	14.42	1.02

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