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Sustaining Rice fallow Blackgram (Cv: *Vamdan 2*) yields through foliar spray using organic phytohormones

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Abstract

Field experiment was conducted at the Experimental farm, Department of Agronomy, Bharath Institute of Higher Education and Research, School of Agriculture, Selaiyur, Chennai to trace the effect of foliar spray of organic phyto hormones on rice fallow black gram, raised as the relay crops during January 2022. All the treatments imposed significantly influenced the growth and yield character of black gram. Among the treatmentsT_6- foliar spray of 5% Panchakavya and 10% vermiwash recorded higher plant height at 30, 45 DAS and at harvest (18.3, 47.4 and 55.1 cm), dry matter production (1637, 2145, 3001kg/ha) respectively. Highest number of seed pod^{-1} of 7.27, maximum number of pods/plant15.28, seed yield (974 kg/ha) and haulm yield (2360 kg/ha) was registered. In contrast, T_1 – water spray recorded the least plant height, DMP, number of seeds pod^{-1}, number of pods/plant, seed yield and haulm yield.

Key words : Plant height, DMP, vermiwash, panchakavya, jeevamrut, seed yield and haulm yield.

Black gram (*Vigna mungo* L. *Hepper*) ranked in the third position regarding economic significance among the pulses is an indeterminate plant in habit of flowering and fruiting with continuous competition for available assimilates between vegetative and reproductive sinks throughout the growth period ,is evident. Since the source is highly limited in pulses with lowered translocation of assimilates to the growing reproductive sinks, the genetic make-up, the physiological factors *viz.,* insufficient partitioning of assimilates, poor pod setting due to flower abscission and lack of nutrients during critical stages of crop growth is quite a demand for pulse production[4]. Nevertheless the total area under pulses in Tamil Nadu is

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around 3.65 lakh hectares with a production of 3.10 lakh tonnes and average productivity of 851 kg per hectare[13], the per capita consumption of pulses in India is around 30-35 g against the recommendation of Indian Council of Medical Research (ICMR) at 45 g and World Health Organisation (WHO) at 80 g per day. Despite the fact, level of productivity of black gram in India is far below the average productivity compared to other countries. Farmers generally take up sowing with the basal application of nutrients as recommended and there is no regional recommendation of foliar nutrition during the crop growth period. Though the black gram crop plays a major role, in the Indian diet, the yield deterioration due to less attention and raising under neglected status need to be addressed, to overcome the constraint.

Since blackgram crop is cultivated under resource constraint situations, the availability of soil applied nutrients is impervious, and necessarily foliar spray of nutrients is desirable for better and instantaneous results[3]. Foliar nutrition ensures easy penetration into the leaf through cuticle or stomata and enter the cells facilitating absorption of nutrients. Foliar application is credited with remarkably rapid absorption, and nearly complete utilization of nutrients, elimination of leaching losses, and fixation and helps in regulating the uptake of nutrients by plants[6]. As fertilizers application is neglected through top dressing or point placement or basal, due to the symbiotic nitrogen fixation in pulse crops, the other primary nutrients like P_2O_5 and K_2O is supplemented and foliar fertilization is best suited for rice fallow black gram[5].

Apparently, in the rice fallow situation, the pulses are sown prior to the harvest of the rice crop and fertilizer incorporation becomes impossible. Under these circumstances, foliar application of nutrients would be more appropriate, efficient and economical than that of soil application[1]. Hence, there is ample scope for enhancement of the production and productivity of rice fallow black gram by proper agronomic practices with foliar application of organic phyto hormone spray. Several strategies like the use of good quality seeds, high-yielding varieties, proper nutrient and irrigation management along with the adoption of organic phytohormone ,foliar spray facilitates to augment its productivity level.

The organic phytohormone spray supplies nutrients for exploiting the genetic potential of the crop.The nutrient composition of the organic phytohormones tried in the present investigation is represented in Table:1 Hence the present investigation was carried out to study on the effect of foliar spray of organic phytohormone on rice fallow blackgram.

Field experiment was conducted at the Experimental farm, Department of Agronomy, Bharath Institute of Higher Education and Research, School of Agriculture, Selaiyur, Chennai. The weather of Selaiyur is moderately warm with hot summer months, while the maximum temperature ranges from 27.8 °C / 82.1 °F with an average temperature of 31.4 °C 88.5 °F, May, the hottest month of the year. At 24.1 °C /75.4 °F on average, January being the coldest month of the year.

The experiment was laid out in Randomized Block Design (RBD) with three replications and seven treatments. The fertilizers were applied to the experimental field as per the recommended manurial schedule of

25:50:25 and 20 kg of N:P:K and S kg/ha with Urea (46% N). Di ammonium phosphate (18% N) and (46% P_2O_5) and Muriate of potash (60% K_2O) fertilizers being used to supply N, P, K and S nutrients respectively. Full dose of nitrogen was applied as two splits on 30 and 45 days after sowing. In addition as per the treatment schedule the prescribed quantities of foliar spray of 3% panchakavya (Fig. 2), foliar spray of 10% jeevamruth (Fig. 3), foliar spray of 10% vermiwash (Fig. 4), foliar spray of 10% cow urine at 30 and 45 DAS was tried to trace the total potential of the nutrients towards crop performance and the details are as follows;

Treatment details

T_1 -	Water spray
T_2 -	Foliar spray of 3% panchakavya at 30 and 45 DAS
T_3 -	Foliar spray of 10% jeevamruth at 30 and 45 DAS
T_4 -	Foliar Spray at 10% vermiwash 30 and 45 DAS
T_5 -	Foliar Spray of 10% cow urine at 30 and 45 DAS
T_6 -	Foliar spray of 5% panchakavya at 10% vermiwash at 30and 45 DAS
T_7 -	Foliar spray of 5% panchakavya +10%cow urine at 30 and 45 DAS

Preparation of, panchagavya jeevamrut, vermiwash :

Panchakavya (Fig. 1) consists of nine products viz. cow dung, cow urine, milk, curd, jaggery, ghee, banana, tender coconut and water. When suitably mixed and used, these have miraculous effects. After 3 days mix cow urine and water and keep it for 15 days with regular mixing both in morning and evening hours.

Jeevamrut (Fig. 2) is the traditional Indian bio pesticide and organic manure that is prepared by the unique technique of fermentation of the combined mixture of cow dung, cow urine, jaggery, pulse flour, soil and water. Not only it is cost effective but it is beneficial for both plants and soil. Take 100 litre water in barrel and add 10 kg cow dung plus 10 litres of cow urine. Mix well with the help of wooden stick add two kg jaggery and two kg of gram or any pulse flour mix this solution well with wooden stick. Keep this solution for fermentation for 5 to 7 days.

Vermiwash (Fig. 3) is a liquid extract produced from vermicompost in a medium where earthworms are richly populated. It comprises of a massive decomposer bacteria count, mucus, vitamins, different bioavailable minerals, hormones, enzymes, different antimicrobial peptides, *etc*.

Growth attributes :

Plant Height : Among the different treatments, the higher plant height (Fig. 4) was observed under T_6 -Foliar spray of 5% panchakavya and 10% vermi wash at 30 and 45 DAS this was followed by the treatment T_7 - Foliar spray of 5% panchakavya +10% cow urine at 30 and 45 DAS at all stages of crop growth. The treatment was found to be significantly superior over other treatments by recording higher plant height of 30, 45 DAS and at harvest respectively (18.3, 47.4 and 55.1 cm). The other treatments *viz.,* T_4 – Foliar

Table-1. Chemical composition of Vermiwash, Jeevamrut and Panchagavya

S.No	Nutrient	Vermiwash Quantity (ppm)	Jeevamrut Quantity (ppm)	Panchagavya Quantity (ppm)
1.	Nitrogen	10	140	229
2.	Phosphorus	109	104	209
3.	Potassium	250	84	232
4.	Sodium	8 ±1	-	90
5.	Calcium	3 ± 1	-	25
6.	Copper	0.01 ± 0.001	51	-
7.	Ferrous	0.066 ± 0.001	318	-
8.	Magnesium	158.44± 23.42	46	-
9.	Manganese	0.58 ± 0.040	-	-
10.	Zinc	0.02 ± 0.001	12	-

spray at 10% vermi wash 30 and 45 DAS was on par with T_5 – Foliar spray of 10% Cow urine at 30 and 45 DAS and T_2 – foliar spray of 3% panchakavya at 30 and 45 DAS was on par with T_3 – Foliar spray of 10% jeevamruth at 30 and 45 DAS. The least plant height of 8.8, 24.1 and 30.21 cm at 30, 45 DAS and at harvest respectively was recorded in water spray (T_1). Reason for increased plant height was mainly attributed to the growth as reported by Ramaswamy and Vijaykumar (2009). Moreover the foliar spray of organics had positive impact on replenishing the crop required nutrients for the blackgram crop grown under rice fallow conditions usually deprived by giving less importance and to rely on residual nutrient status alone based on residual nutrient status.

Dry matter production (DMP) :

All the treatments imposed, had exerted significant influence on dry matter production (Fig. 5) at all the stages of crop growth. Among the treatments, application of foliar spray of 5% panchagavya and 10% vermiwash at 30 and 45 DAS (T_6) recorded the highest dry matter production of (1637, 2145 and 3001) respectively at 30, 45 DAS and at harvest. This was followed by the treatment, T_7 - Foliar spray of 5% panchakavya +10%cow urine (1558,2048 and2778) at 30 and 45 DAS. The other treatments *viz.,* T_4 – Foliar Spray of 10% vermi wash was on par with T_5 – foliar Spray of 10% cow urine at 30 and 45 DAS and T_2 – foliar spray of 3% panchakavya was on par with T_3 – Foliar spray of 10% jeevamruth at 30 and 45 DAS respectively. The dry matter production of 1201, 1632, 2021 at 30, 45 DAS and at harvest respectively was recorded in water spray (T_1). The significant improvement in the accumulation of dry matter in plant and its distribution in different plant parts might be attributed to increased supply of plant nutrients, specific weight of leaf chlorophyll synthesis, nitrogen metabolism and phytohormone[7]. Besides, the supply of nutrients through panchakavya spray might have enhanced the protoplasmic constituents, leading to the

accelerated process of cell division and elongation. Eventually the increased yield of blackgram was observed as reported by Thinde *et al.*[12].

Yield attributes (Table-2) :
Number of seeds pod^{-1}

The highest number of seeds pod^{-1} of 7.69 was observed in T_6 - Foliar spray of 5% panchakavya and 10% vermi wash at 30 and 45 DAS was followed by the treatment, T_7 - foliar spray of 5% panchakavya +10% cow urine (7.27) at 30 and 45 DAS. The other treatments *viz.*, T_4 – foliar spray of 10% Vermi wash at 30 and 45 DAS was on par with T_5 – foliar spray of 10% cow urine at 30 and 45 DAS and T_2 – foliar spray of 3% panchakavya

Table-2. Effect of foliar nutrition on yield attributes of blackgram

Treatments	Number of seeds pod^{-1}	Number of pod plant^{-1}
T_1 – Water spray	5.82	9.51
T_2 – Foliar spray of 3% panchakavya at 30 and 45 DAS	6.25	10.95
T_3 – Foliar spray of 10% jeevamruth at 30 and 45 DAS	6.12	10.63
T_4 –Foliar spray at 10% vermiwash 30 and 45 DAS	6.68	12.20
T_5 – Foliar spray of 10% Cow urine at 30 and 45 DAS	6.57	12.02
T_6 –Foliar spray of 5% panchakavya + 10% vermi wash at 30 and 45 DAS	7.69	15.28
T_7 – Foliar spray of 5% panchakavya +10% cow urine at 30 and 45 DAS	7.27	14.1
S.Ed	0.12	0.44
CD ($_P$ = 0.05)	0.27	0.95

Fig. 1

Fig. 2

Fig. 3 Vermiwash

Fig. 4

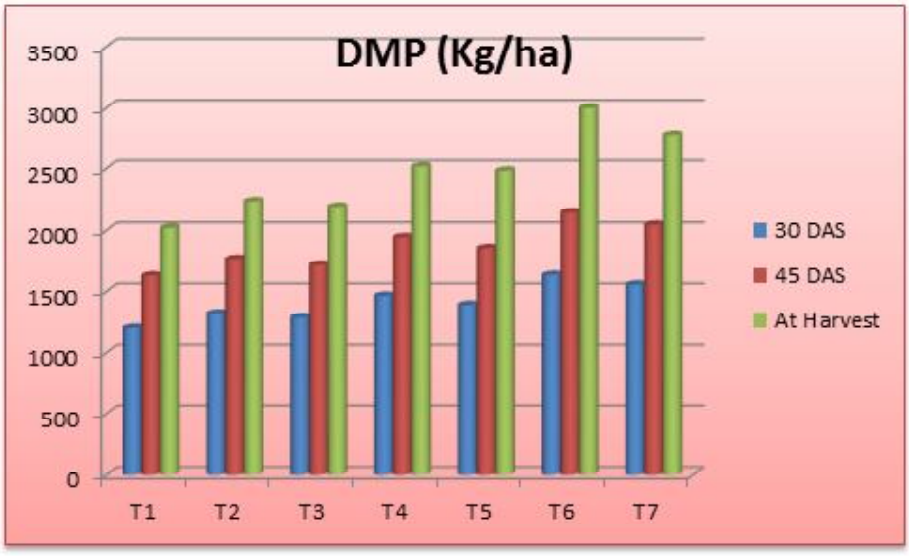

Fig. 5

at 30 and 45 DAS was on par with T_3 – foliar spray of 10% jeevamruth at 30 and 45 DAS. The performance of phyto hormone spray towards the yield attributes of rice fallow black gram might be due to the increased number of pods and its growth attainment might be due to the increased supply of almost all plant essential nutrients which provides good vegetative growth thus increased the photosynthetic activity and further the translocation and accumulation of photosynthates in the sinks. The results were in line with the findings of Datta and Kulkarni[2]. The least number of seed pod^{-1} of 5.82 was observed in the treatment water spray (T_1).

Number of pods plant^{-1}

The treatment T_6 - foliar spray of 5% panchakavya and 10% vermi wash recorded the highest number of pod plant^{-1} of 15.28. This was followed by the treatment, T_7 - foliar spray of 5% panchakavya +10%cow urine (at 30 and 45 DAS). The other treatments *viz.,* T_4 – foliar spray at 10% vermi wash 30 and 45 DAS was on par with T_5 – foliar spray of 10% cow urine at 30 and 45 DAS and T_2 – Foliar spray of 3% panchakavya at 30 and 45 DAS was on par with T_3 – Foliar spray of 10% jeevamruth at 30 and 45 DAS. The least number of pods plant^{-1} of 9.51 was observed in the treatment T_1- water spray. The maximum number of pod plant^{-1} in T_6, may be due to cytokinin accumulation and their secondary buds containing b- auxins, which helped the plants to produce large numbers of pods per plant[14]. The results are in conformity with Somasundaram *et al.*[10], Tharmaraj *et al.*[11] as the panchakavya spray activated photosynthetic systems with enhanced biological efficiency and metabolites, leading to increased yields. The complementary effect of vermiwash also proved to be an effective fertilizer, which contributed to the upsurge of growth and yield of blackgram plants[9].

On the basis of the result obtained through the field experiment conducted , it may be inferred that the application T_6-Foliar spray of 5% panchakavya and 10% vermiwash had a remarkable effect on the growth, yield attributes, seed and haulm yield of rice fallow black gram. Further proved as an effective practice, for augmenting higher yields in black gram. The combined effect of panchakavya and vermiwash had produced salient results by increasing the yield, quality and in fact it is less expensive and more eco-friendly with no ill effects. Hence, panchakavya and vermiwash are environment friendly subsitutes, that positively enhanced growth during vegetative and reproductive phase offering synergistic effect of blackgram performance. Undoubtedly the higher growth and yield performance owing to the complementary impact of vermiwash and panchagavya opens new vistas of rice fallow blackgram production achievements in the future.

References :

1. Balusamy, M. and N. Meyyazhagan. (2000). Foliar nutrition to pulse crop. Training manual on recent advances in pulses production technology, CASA, Tamil Nadu Agric. Univ., pp 113-115.
2. Datta, P. and M. Kulkarni (2014). *Legume Research, 37*(3): 321-328.
3. Jamal A., I.S. Fazli, S. Ahmad, K.T. Kim, D.G. Oh and M.Z. Abdin, (2006). *Journal of Plant Biology, 49*(6): 513- 517.
4. Kalita, P., S.C. Dey and K. Chandra. (1995). *Indian J. Pl. Physiol. 38*(3): 197-202.
5. Latha, M.R. and T. Nadanasababady, (2003). *Agric.Rev., 24*(3): 229-234.
6. Manonmani, V. and P. Srimathi, (2009). *Madras Agric. J., 96*(16): 125-128.
7. Pagar, R.D., M.M. Patel and S.D. Munde (2015). *Agriculture for Sustainable Development. 3*(1): 57-59.
8. Ramaswamy, V. and A. Vijaykumar (2009). *Seed Res., 37*(1&2): 48-52.
9. Sobha R., P. Ganesh, M. Mohan, S.S. Saleem, and G.S. Vijay Laxmi, (2003) *J. Eco Biol. 30*(1): 77-79.
10. Somasundaram, E., N. Sankaran, S. Meena, T.M. Thiyagarajan, K. Chandragiri, and S. Pannerselvam, (2003). *Madras Agricultural Journal 90*(1–3): 169–172.
11. Tharmaraj K., P. Ganesh, R. Sureshkumar, A. Anandan, and K. Kolanjinathan (2011). *Int. J. Pharm. Biol. Arch. 2*(6): 1611-1614.
12. Thinde, S.S., A.S. Sidhu and N.K. Sekhon, (2001). *J. Res. Punjab Agric. Univ., 38:* 1-5.
13. Tnstat. (2014). Online databases. In: http://www.tnstat.com.
14. Vennila, C. and C. Jayanthi, (2008). *J. Soils Crops, 18:* 36-40.