Economic feasibility of black gram [Vigna mungo (L.) Hepper] under organic farming

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Abstract

An experiment was conducted to find out the economic feasibility of black gram under organic farming at Organic Farm, ASPEE College of Horticulture, Navsari Agricultural University, Navsari, Gujarat in summer season of the year 2021. The experimental design used was Randomized Block Design with two factors i.e., three levels of each Soil application (S1:100% RDN through NADEP compost, S2: Ghan-jivamrut @ 500 kg/ha and S3: Ghan-jivamrut @ 500 kg/ha + Jivamrut @ 500 l/ha) and foliar application (F1: Control, F2: Novel organic liquid nutrient @ 1 percent and F3: Moringa leaf extract@ 3 percent). From the total nine treatments, the S1 treatment resulted in significantly the highest seed yield and maximum net return and BCR. While from foliar application the F3 treatment recorded significantly higher seed yield and stover yield which was at par with F1 treatment. The F2 treatment also recorded the highest net return and BCR. The findings of the study conclude that, in order to achieve higher productivity and profitability with soil application of 100 percent RDN through NADEP compost and foliar application of either 3 percent Moringa leaf extract or 1 percent Novel organic liquid nutrient at 15, 30, and 45 days after sowing in summer black gram cv. GU 3 can be carried out, as these treatments are economically feasible under organic farming.

Keywords: Black gram, economics, Ghan-Jivamrut, jivamrut, Moringa leaf extract, NADEP compost, novel organic liquid nutrient, organic farming, yield

Introduction

In a world where environmental problems are becoming increasingly acute and health concerns are coming to the fore, organic farming is no longer just a trend but the indispensable future of agriculture. Organic farming is not just a production method, but a philosophy of sustainability that minimizes the use of synthetic fertilizers, pesticides, and growth regulators, relying instead on natural processes. This approach is not only about growing food, but also about actively engaging with nature, focusing on biodiversity conservation and environmental sustainability (Anon., 2023) [13]. It also helps to reduce the use of high cost chemical fertilizers. In pulse crop where low inorganic fertilizers are needed, these low rate can be easily replaced by organic sources. Black gram (Vigna mungo L. Hepper) one of the most important short duration pulse crop grown in India. It can be used for seed, green manure as well as fodder purpose (Ajila and Ra, 2009) [14]. It has high protein contain nearly about 26% (Selvakumar et al., 2012) [17]. Being pulse crop it has ability to fix atmospheric nitrogen in soil which reduces use of high cost inorganic fertilizers (Zahran, 1999) [18]. NADEP compost is one of the most effective and beneficial method of biological recycling by which waste is converted into organic manure. The Reduces the cost of cultivation as all the materials are easily available on-field (Kumawat et al., 2017) [12]. A good alternative can be the cow based organic nutrient sources like jivamrut, bijamrut, Panchagavya, Ghan-jivamrutit, etc. which helps to enhance microbial activity of soil which improves its fertility. It is eco-friendly and helps to yield good quality produce (Kaur, 2020) [11]. To lower the burden of chemical fertilizers, the Moringa leaf extract would be better option. It acts as a cost effective bio-stimulants that enhance several physiological processes and stimulate the growth and development of crops by increasing nutrient use efficiency and reducing fertilizers without affecting the quality and crop yield (Bulgari et al., 2015) [5]. Fresh Moringa oleifera leaves have been shown to have zeatin, a cytokinin related hormone (Fuglie,
Materials and Methods
The field investigation was undertaken during summer season of the year 2021 at Organic Farm, ASPEE College of Horticulture, Navsari Agricultural University, Navsari under South Gujarat heavy rainfall zone. The experiment was laid out in Randomized Block Design with Factorial concept (FRBD) and replicated thrice. There were two factors each having three levels: the first factor viz., soil application (S1: 100% RDN through NADEP compost, S2: Ghan-jivamrut @ 500 kg/ha and S3: Ghan-jivamrut @ 500 kg/ha + Jivamrut @ 500 l/ha) and second factor was foliar application (F1: Control, F2: Novel organic liquid nutrient @ 1% and F3: Moringa leaf extract @ 3% was given thrice at 15, 30 and 45 DAS). So total of nine treatments were there. The soil of experimental field was clayey in texture, fertility level was high for OC and available K2O, although available N and P2O5 was found in medium range. The weather condition during the experimental period favored growth and development of black gram.

Results and Discussion
Seed yield: The significant result was obtained for the seed yield as the effect of soil application of organic nutrient sources showed positive impact on it. The result revealed that the application of 100 percent RDN through NADEP compost significantly recorded the highest seed yield i.e. 1041 kg/ha. While the S3 treatment where 500 kg/ha Ghan-jivamrut was applied recorded the lowest seed yield of 836 kg/ha. An appraisal of seed yield data indicated that foliar spray of liquid organic sources significantly influenced the seed yield as much variation was observed. The foliar spray of 3 percent Moringa leaf extract (F2 treatment) resulted in significantly higher seed yield (1051 kg/ha) and was statistically similar with foliar spray of 1 percent Novel organic liquid nutrient (F3 treatment) which recorded 937 kg/ha seed yield. While the F0 treatment as control where no foliar application was given recorded the lowest seed yield i.e. 805 kg/ha. The reason for the higher seed yield due to Moringa leaf extract may be that it increases the loading and unloading of assimilates across membrane boundaries of the vascular tissues leading to increase in yield. Cytokinins present in MLE also promote carbohydrate metabolism and create new source-sink relationships leading to increased yield of crop. The influence of interaction effect of soil and foliar application on the seed yield was found to be statistically non-significant. No variation in seed yield was observed due interaction effect. The previous experiment results noted by Chaudhari (2021) [6] in green gram and Rathva (2013) [14] in pigeon pea, Abohassan and Abusuraw (2018) [1] in green gram, Gunasekar et al. (2018) [8], Nivethadevi et al. (2021) [13] in black gram and Irshad et al. (2022) [9] in chickpea were found to be closely related with the findings of present research work.

Stover yield: The stover yield was significantly influenced by the soil application of the organic nutrient sources and the S1 (100% RDN through NADEP compost) treatment recorded significantly higher stover yield of 2696 kg/ha and it remained at par with S2 (Ghan-jivamrut @ 500 kg/ha + Jivamrut @ 500 l/ha) treatment which recorded 2536 kg/ha stover yield. The result revealed that the foliar application of Moringa leaf extract @ 3 percent viz., F2 treatment recorded significantly higher stover yield of 2725 kg/ha but was statistically similar with F1 treatment where, Novel organic liquid nutrient @ 1 percent was sprayed and it recorded 2446 kg/ha stover yield. The F0 treatment, control where no spray was given recorded the lowest 2228 kg/ha stover yield (Fig. 1). The statistically non-significant result was obtained for the stover yield due to the interaction effect between the soil and foliar application of various nutrient organic sources. The results of present study are in conformity with the previously reported findings of Chaudhari (2013) [8] in green gram and Rathva (2013) [14] in pigeon pea, Gunasekar et al. (2018) [8] in black gram, Nivethadevi et al. (2021) [13] in black gram and Irshad et al. (2022) [9] in chickpea.

![Fig 1: Effect of different treatments of seed and stover yield of black gram](https://www.agronomyjournals.com)
Economics
Based on the prevailing market prices of the inputs and produce, the economics of the different treatments i. e., the cost of cultivation, net benefit and BCR was calculated on hectare basis which is depicted in Table 1. The economics analysis of different soil application treatment revealed that the highest gross income (Rs. 88674/ha) and net return (Rs. 55237/ha) was noted for the S1 i. e. 100% RDN through NADEP compost treatment followed by S2 i. e., Ghan-jivamrut @ 500 kg/ha + Jivamrut @ 500 l/ha treatment with gross income of Rs.78430/ha and net return of Rs. 43432/ha. However, the cost of cultivation was lowest Rs. 33437/ha for S1 treatment while it was the highest for the S3 treatment i. e. Rs. 34998/ha. The result concluded that S1 treatment was considered best as it recorded maximum Benefit-Cost ratio of 1.65.

The result regarding foliar spray of different liquid organic sources indicated that F2 i. e. Moringa leaf extract @ 3 percent treatment as the best because it recorded maximum yield which generated higher gross income of Rs. 89540/ha and net return of Rs. 54024/ha. So, it recorded the highest BCR 1.52 among the various treatment. The gross return (Rs. 79842/ha) and net return (Rs. 43606/ha) of F1 i. e. Novel organic liquid nutrient @ 1 percent treatment was found better than the control treatment but due to the highest cost of cultivation (Rs. 36236/ha) it recorded the lowest BCR i. e. 1.20 (Table 1). From the various combination treatments as shown in Table 1 of soil and foliar application of different nutrient organic sources, it was observed that the S1:F2 combination (100% RDN through NADEP compost + Moringa leaf extract @ 3%) resulted in the highest seed yield (1156 kg/ha) and stover yield (2991 kg/ha) with the maximum net return of Rs. 6360/ha and BCR of 1.83 followed by the S1:F1 (100% RDN through NADEP compost + Novel organic liquid nutrient @ 1%) combination also gave good resulted in terms of seed yield (1086 kg/ha), net return (Rs. 56571/ha) and BCR (1.59).

Table 1: Effect of different treatments on yield and economics of black gram

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Seed yield (kg/ha)</th>
<th>Stover yield (kg/ha)</th>
<th>Cost of cultivation (₹/ha)</th>
<th>Gross income (₹/ha)</th>
<th>Net returns (₹/ha)</th>
<th>BCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor I: Soil application (S)</td>
<td></td>
<td></td>
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<tr>
<td>S1 - 100% RDN through NADEP compost</td>
<td>1041</td>
<td>2696</td>
<td>33437</td>
<td>88674</td>
<td>55237</td>
<td>1.65</td>
</tr>
<tr>
<td>S2 - Ghan-jivamrut @ 500 kg/ha</td>
<td>836</td>
<td>2166</td>
<td>33998</td>
<td>71169</td>
<td>37171</td>
<td>1.09</td>
</tr>
<tr>
<td>S3 - Ghan-jivamrut @ 500 kg/ha + Jivamrut @ 500 l/ha</td>
<td>917</td>
<td>2536</td>
<td>34998</td>
<td>78430</td>
<td>43432</td>
<td>1.24</td>
</tr>
<tr>
<td>Factor II: Foliar application (F)</td>
<td></td>
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<tr>
<td>F0 – Control</td>
<td>805</td>
<td>2228</td>
<td>30680</td>
<td>68891</td>
<td>38211</td>
<td>1.25</td>
</tr>
<tr>
<td>F1 - Novel organic liquid nutrient @ 1%</td>
<td>937</td>
<td>2446</td>
<td>36236</td>
<td>79842</td>
<td>43606</td>
<td>1.20</td>
</tr>
<tr>
<td>F2 - Moringa leaf extract @ 3%</td>
<td>1051</td>
<td>2725</td>
<td>35516</td>
<td>89540</td>
<td>54024</td>
<td>1.52</td>
</tr>
</tbody>
</table>

* Selling price: Seed = Rs. 80 per kg and Stover = Rs. 2 per kg

Conclusion
The findings of the study conclude that, in order to achieve higher productivity and profitability with soil application of 100 percent RDN through NADEP compost and foliar application of either 3 percent Moringa leaf extract or 1 percent Novel organic liquid nutrient at 15, 30, and 45 days after sowing in summer black gram cv. GU 3 can be carried out, as these treatments are economically feasible under organic farming.

Reference

