**Original Research Article**

**AGRONOMIC STRATEGIES TO IMPROVE THE YIELD OF BLACKGRAM**

**ABSTRACT**

**Aims:** This study investigates the impact of weed management and foliar nutrition on growth and yield attributes of blackgram assessing various combination of weed management and foliar nutrition, the research aims to elucidate their effects on blackgram growth

**Study design and Methodology:** the treatment was imposed in factorial randomized block design (FRBD) with 12 treatment and 3 replications.

**Place and Duration of Study:** The study took place in Department of Agronomy, Faculty of Agriculture, Annamalai University, Chidambaram, Tamil Nadu, India. The research was conducted from April- July 2024. And VBN-8 variety has chosen for the experiment.

**Results:** The results of the experiment revealed that among the different treatments tested. EPOE application sodium acifluorfen @160 g a.i ha-1 + clodinofob propargyl @ 80 g a.i ha-1 on 15 DAS + Hand weeding on 30 DAS + vermiwash @ 10 % on 30 and 45 DAS recorded with highest plant height(30.66,57.53), leaf are index(1.93, 2.86), dry matter production(1752 kg ha-1), effective root nodules(25.4), pod length (5.91) number pods per plant(12.67),grain yield(730 kg ha-1) and haulm yield(1535 kg ha-1) and it excelled all the others treatments.

**Conclusion:** the research concludes that treatment (A4B2) EPOE application sodium acifluorfen @160 g a.i ha-1 +clodinofob propargyl @ 80 g a.i ha-1 on 15 DAS + hand weeding on 30 DAS + vermiwash @ 10 % on 30 and 45 DAS(A4B2) was most effective method in control weeds and recorded higher grain yield

*Keywords* : EPOE, Vermiwash, plant height, pod length, grain yield.

1. **INTRODUCTION**

Blackgram is mainly cultivated in the tropical to sub-tropical countries like India, Pakistan, Sri-Lanka, Burma and some countries of South East Asia. Black gram is grown in many parts of India since it is a short duration pulse crop. In our country, pulses are grown in an area of 23.63 million hectares with a total production of 14.76 million tonnes and are considered to be one of the largest pulses producing country in the world. In Tamil Nadu, blackgram is cultivated in an area of 4.07 lakh hectares, with a total production of 2.69 lakh tonnes and a productivity of 660 kg ha−1 (Marimuthu *et al*., 2024). This popular pulse goes by various common names like black matpe, urd bean, mash bean, black mung bean, mashkalai, urid etc. India produces about 24.5 lakh tons of urad annually from about 4.6 million hectares of area with an average productivity of 533 kg per hectare in 2020-21 (Department of Agriculture and Cooperation, Govt. of India, 2021). In India the average productivity of black gram continues to be low mainly due to various reasons which includes poor management practices, non-adoption of improved variety and recommended practices, heat and moisture stress, weed infestation, various physiological and biochemical as well as inherent factors associated with the crop. Among these several factors responsible for low yields of blackgram, weed infestation is considered as one of the major factors. Generally, yield loss due to unchecked weed growth in blackgram ranges from 27 to 100% (Mansoorie *et al*., 2015). Being grown as a subsidiary crop, it is given less care and inputs and in addition to that, weeds pose a serious threat and it competes for the already limited resources like light, moisture, nutrients and space in the field and which leads to a significant reduction in the yield of blackgram to a great extent. This crop needs more attention during summer as along with the crop, weeds also grow more luxuriantly and vigorously due to better sunshine and irrigation during this time. Therefore, it becomes important to control the weeds by suitable methods and practices, especially during the critical period of crop weed competition (10-40 DAS) in summer blackgram crop. Foliar nutrition is seen as an important technique of fertilizer delivery because foliar nutrition usually penetrates the leaf cuticle or stomata and enters the cells, allowing for easy and rapid utilization. When compared to soil-applied fertilizers, foliar-sprayed nutrients are more effective. Foliar nutrition can be widely used to diminish nutritional deficiencies in crop plants at critical growth stage (EI-hady and Hussein 2021). In order to exploit the full yield potential of black gram, it became imperative to undertake such investigations directed towards weed management with the objective to identify the most effective and economical technique for improving the growth and yield potential of blackgram.

**2. MATERIAL AND METHODS**

A field experiment was conducted with VBN 8 varitey in GL 2 block of experimental farm, Department of agronomy, Faculty of Agriculture, Annamalai University, Annamalai Nagar. The geographical location of Annamalai Nagar is 11.24° North latitude and 79.44° East longitude and at an altitude of + 5.79 m above sea level. The soil of the experimental field is clayey loam with a pH of 7.9. The soil is low in available N (234.0 kg ha-1), medium in available P2O5 (20.50 kg/ha) and high in available K2O (305.7 kg ha-1). The experiment was laid out in a Factorial Randomized Block Design (FRBD) with 2 factors namely, weed management and foliar nutrition, totally with a combination of 12 treatments, and three replications. The treatment comprises four weed management and their foliar nutrition practices. They are

**Factor -A (Weed management)**

**A1**- unweeded control,

**A2**- EPOE application of imazethapyr @ 50 g a.i ha-1 on 15 DAS + hand weeding on 30 DAS

**A3** - EPOE application of Quizalofob-ethyl@50g a.i ha-1 on15DAS+handweeding on 30 DAS,

**A4**- EPOE application of sodium acifluorfen @160 g a.i ha-1+ clodinofob propargyl @80 g a.i ha-1 on 15 DAS + hand weeding on 30 DAS.

 **Factor- B (foliar nutrition)**

 **B1**- Control (water spray),

 **B2**- vermiwash spray @ 10 % on 30 and 45 DAS,

 **B3**-Nano DAP spray @ 3 ml/l on 30 and 45 DAS.

The spacing adopted is 30x 10cm. Recommended fertilizer scheduled of 25:50:25 kg ha-1 were adopted. The required quantities of herbicide were calculated treatment wise and applied to the respective plot as per treatment schedule. All the herbicides were applied in the morning hours by using hand operated knapsack sprayer fitted with flood Jet nozzle using 500 l of water per hectare The vermiwash and Nano DAP was purchased from the market and the required quantities of 10 % vermiwash and Nano DAP 3 ml/l was prepared and sprayed to the respective plots as per the treatment schedule on 30 and 45 DAS. Spray fluid used was water @ 500 l ha-1.

3. results and discussion

**3.1 PLANT HEIGHT**

According to the weed management practises (Table 1), EPOE application of sodium acifluorfen @160 g a.i. ha-1 + clodinofob propargyl @ 80 g a.i. ha-1 on 15 DAS + Hand weeding on 30 DAS (A4) registered higher plant height of 28.97 and 53.03 cm respectively at 30 DAS and 60 DAS(Table-1) This could be due to weed free condition obtained with two hand weedings which might have given competitive advantage to crops over weeds in utilizing the moisture, nutrient, light and space and thus the crops in this treatment gave better results. Similar findings were observed by Kundu *et al*. (2011), Rao *et al*. (2015) This was followed by of EOPE application of imazethapyr @ 50 g ai ha-1 on 15 DAS + hand weeding on 30 DAS (A2) and EPOE application quizalofob ethyl @ 50 g a.i. ha-1 on 15 DAS + hand weeding on 30 DAS (A3). The least plant height of 22.13 and 40.06 cm was recorded at 30 DAS and 60 DAS in un-weeded control (A1) respectively.

Regarding the application of foliar nutrition among the treatments tested, the application of vermiwash @ 10 % on 30 and 45 DAS (B2) recorded maximum plant height of 27.80 and 50.55 cm respectively and was significantly superior over other treatments at 30 DAS and 60 DAS this id due to the foliar spray of vermiwash provided balanced nutrition to blackgram and helped in improving the quality parameters as it has readily available nutrients and growth hormones. This result is in agreement with the findings of Sutar *et al*., (2019). This was followed by Nano DAP @ 3ml/l on 30 and 45 DAS (B3). The least plant height of 24.42 and 43.28 cm was recorded in control (B1).

Regarding The interaction effect between different weed management practices and foliar nutrition application was found to be significant at 30 and harvest stages. The EPOE application of sodium acifluorfen @160 g a.i. ha-1 + clodinofob propargyl @ 80 g a.i. ha-1 on 15 DAS + hand weeding on 30 DAS + vermiwash spray @ 10 % on 30 and 45 DAS (A4B2) recorded maximum plant height of 30.66 and 57.53 cm at 30 DAS and harvest stage respectively and it was the most effective treatment concerning the plant height of the crop. The results of this study are validated by Chovatia *et al.* (2010). Higher weed populations remove more nutrients from the soil and the nutrients faster than crops. Therefore, assuring greater nutrient availability to the crop during its initial period of growth due to suppression of weeds by suitable herbicide resulted in increasing the growth of blackgram. This was followed by the EPOE application of sodium acifluorfen @160 g a.i. ha-1 + clodinofob propargyl @ 80 g a.i. ha-1 on 15 DAS + hand weeding on 30 DAS + Nano DAP @ 3 ml/l at 30 and 45 DAS (A4B3). Maximum plant height with the noted treatment might be due to less weed population, which reduced crop weed competition for soil moisture, solar radiation, plant nutrients and space during active growth period resulting in better nutrient availability which helped in rapid cell development and facilitated luxurious crop growth. Similar results were also reported by Susmitha *et al*. (2019). The least plant height of 20.80, 30.67 and 38.10 cm were recorded in the unweeded control(A1B1) at 30 DAS and harvest respectively.

**3.2 LEAF AREA INDEX**

Regarding weed management practices, EPOE application of sodium acifluorfen @160 g a.i. ha-1 + clodinofob propargyl @ 80 g a.i. ha-1 on 15 DAS + hand weeding on 30 DAS(A4) registered the highest leaf area index of 1.72 and 2.59 at 30 and 45 DAS respectively and were significantly superior over the other treatments (Table-2) This is due to better weed management at the critical crop growth stage of the crop which minimize the competition between crops and weeds and lead to higher uptake of nutrients resulting in better crop growth and development. This finding was similar to the finding of Kumar *et al.,* (2018) and Jat *et al*., (2021). This was followed by the EPOE application of imazethapyr @ 50 g a.i. ha-1 on 15 DAS + hand weeding on 30 DAS (A2). The least leaf area index of 1.11 and 1.43 was recorded at 30 and 45 DAS respectively in unweeded control(A1). The lowest leaf area index under weedy check could be due to higher density of weed population leading to poor crop growth parameters. These results were in accordance with the findings of Das *et al*. (2014). Leaf area index was greater with herbicide applied plots over the unweeded check and two hand weeding at 30 DAS irrespective of stages and seasons

 Among the various foliar nutrition, application of vermiwash @ 10 % on 30 and 45 DAS (B2) registered higher leaf area index of 1.60 and 2.35 on 30 and 45 DAS, and it excellent other treatments Vermiwash is also strong in plant growth hormones such auxins, cytokinins, gibberellins, amino acids, and vitamins, which boost plant growth and productivity as well as acting as nematicides and vermiwash, responsible for plants’ rapid growth and development. Similar results were also obtained by Maya and Sathish (2015). This was followed by the application of Nano DAP @ 3 ml/l on 30 and 45 DAS (B3). The lowest leaf area index was registered in control (B1) with a value of 1.25 and 1.93 at 30 and 45 DAS, respectively.

Regarding various interaction effects, the treatment combination of EPOE application of sodium acifluorfen @160 g a.i. ha-1 + clodinofob propargyl @ 80 g a.i. ha-1 on 15 DAS + hand weeding on 30 DAS + vermiwash spray @ 10 % on 30 and 45 DAS (A4B2) recorded a higher leaf area index as 1.93 and 2.86 on 30 and 45 DAS. This was followed by the application of sodium acifluorfen @ 160 g a.i.
ha-1 + clodinofob propargyl @ 80 g a.i. ha-1 on 15 DAS + hand weeding on 30 DAS + Nano DAP @ 3 ml/l on 30 and 45 DAS (A4B3). Control (A1B1) registered a least leaf area index with a value of 1.09 and 1.35 at 30 and 45 DAS, respectively. Higher number of leaf area index obtained could be due to better control of all types of weeds like grasses, broad leaved and sedges during early crop growth period. Similar results were also reported by Yadav *et al*. (2015).

**3.3 DRY MATTER PRODUCTION**

Among the weed management practices EPOE application of sodium acifluorfen @160 g a.i. ha-1 + clodinofob propargyl @ 80 g a.i. ha-1 on 15 DAS + hand weeding on 30 DAS (A4) registered with highest dry matter production of 1573.33 kg ha-1 (Table-3) Application of post-emergence herbicide has advantages like minimizing human labour consumption and controlling the second flush of weeds in pulse crops. This finding was similar to Marimuthu *et al*. (2024). This was followed by EPOE application of imazethapyr @ 50 g a.i. ha-1 on 15 DAS + hand weeding on 30 DAS (A2) and it was found to be on par with EPOE application of quizalofob ethyl @ 50 g a.i. ha-1 on 15 DAS + hand weeding on 30 DAS. The lowest dry matter production of 849 kg ha-1 was noticed in the unweeded control (A1).

Among the foliar nutrition application of vermiwash @ 10 % at 30 and 45 DAS resulted with highest dry matter production of 1437.25 kg ha-1 vermiwash could be attributed to the fact that vermiwash 10 % spray was responsible for rapid growth and development of plants. This result was similar finding with Joshi *et al*. (2023). This was followed by the application of Nano DAP @ 3 ml/l on 30 and 45 DAS. The lowest dry matter production 1207 kg ha-1 was recorded in water spray(B1).

The interaction effect was also significant in terms of dry matter production. The EPOE application sodium acifluorfen @160 g a.i. ha-1 + clodinofob propargyl @ 80 g a.i. ha-1 on 15 DAS + hand weeding on 30 DAS + vermiwash @ 10 % on 30 and 45 DAS(A4B2) out stripped all other treatments and resulted with a highest dry matter production of 1752 kg ha-1. This is due to the weed free treatment reduced the crop weeds competition by providing no weed situation in black gram field. Thus, the crop being vigorous by efficiently utilization of nutrients, moisture, and sunlight with space gave better yield leading to highest dry weight of plant (Naidu *et al.,* 2012). This was followed by the application of sodium acifluorfen @160 g a.i. ha-1 + clodinofob propargyl @ 80 g a.i. ha-1 on 15 DAS+ hand weeding on 30 DAS + Nano DAP @ 3 ml/l on 30 and 45 DAS (A4B3). The least dry matter of 815 kg ha-1 was noticed in control (A1B1).

**3.4 POD LENGTH**

Among the different weed management practices, EPOE application of sodium acifluorfen @160 g a.i. ha-1 + clodinofob propargyl @ 80 g a.i. ha-1 on 15 DAS + hand weeding on 30 DAS(A4) resulted with lengthiest pod with a value of 5.41 cm and found significantly superior over other weed management practices (Table 4). This may also be attributed with the better growth of crop in terms of higher leaf area index and dry matter accumulation in these treatments, which may have resulted in better translocation of photosynthetic for development of all the yield attributes. These results are in close conformity with Poonia and Pithia (2013) and Vikas *et al*. (2013). This was followed by the EPOE application of imazethapyr @ 50 g a.i. ha-1 on 15 DAS + hand weeding on 30 DAS (A2). The lowest pod length was registered in unweed control (A1) with a value of 3.47 cm.

It was clear from the data regarding various foliar nutrition, the lengthiest pod of 4.98 cm was observed in the application of vermiwash @ 10 % on 30 and 45 DAS (B2) and was significantly superior over the rest of the treatments. This was followed by Nano DAP @ 3ml/l on 30 and 45 DAS (B3). The shortest pod length with a value of 3.99 cm was recorded in the control treatment(B1). Timely supply of nutrients through foliar spray during peak nutrient demand might have reduced the shedding of flowers resulting in higher number of pods. Similar result was earlier reported by Ashraf *et al*. (2024).

Among the various interaction effects, the EPOE application of sodium acifluorfen @160 g a.i. ha-1 + clodinofob propargyl @ 80 g a.i. ha-1 on 15 DAS + hand weeding on 30 DAS + vermiwash @ 10 % on 30 and 45 DAS(A4B2) registered with lengthiest pod with a value of 5.91 cm. The treatments resulted in increased yield and enhanced yield attributes by ensuring effective weed control during the critical crop-weed competition period. This minimized competition for essential resources such as space, nutrients, and water, thereby promoting better crop development and productivity. This similar result was observed by Kaur *et al*. (2025). This was followed by the application of sodium acifluorfen @ 160 g a.i. ha-1 + clodinofob propargyl @ 80 g a.i. ha-1 on 15 DAS+ hand weeding on 30 DAS + Nano DAP @ 3 ml/l on 30 and 45 DAS (A4B3). The lowest pod length was noticed in unweed control (A1B1) with a value of 3.3 cm.

**3.6 NUMBER OF PODS PLANT-1**

Among the different weed management practices, EPOE application of sodium acifluorfen @160 g a.i. ha-1 +clodinofob propargyl @ 80 g a.i. ha-1 on 15 DAS + hand weeding on 30 DAS(A4) resulted with highest number of pods plant-1 with a value of 11.84 and found significantly superior over the other weed management practices (table-4) the lower weed population had provided a favourable environment to the crop and the least crop weed competition, which resulted in a higher photosynthetic accumulation rate and better translocation to the sink as compared. Similar finding was reported by Reddy *et al*. (2022). This was followed by the EPOE application of imazethapyr @ 50 g a.i. ha-1 on 15 DAS + hand weeding on 30 DAS (A2). The unwedded control (A1) registered with the least number of pods plant-1 with a value of 8.92.

Regarding various foliar nutrition, the highest number of pods per plant-1 with a value of 11.22 was observed in the application of vermiwash @ 10 % on 30 and 45 DAS (B2) and excelled over the rest of the treatments. This was followed by Nano DAP @ 3ml/l on 30 and 45 DAS (B3). The least number of pods plant-1 (9.77) was recorded in the control treatment(B1). The foliar nutrients might have supplemented the nutrient demand of the crop at the critical stage, resulting in better growth and development of the crop and ultimately enhanced the yield attributing characters and promoted a positive source sink gradient of photosynthates translocation guaranteeing seed formation and better grain filling (Manivannan *et al*., 2002)

 Among the various interaction effects, EPOE application sodium acifluorfen @ 160 g a.i. ha-1 + clodinofob propargyl @ 80 g a.i. ha-1 on 15 DAS + hand weeding on 30 DAS + vermiwash @ 10 % on 30 and 45 DAS (A4B2) registered with highest number of pods plant-1 with a value of 12.67 and outstripped all other treatment combinations. This was due to the least competition from weeds for light, as weed is all all-ground resource, due to effective weed control practices which reduced weed growth and gave higher yield attributes. This is in agreement with the finding of Mansoori *et al*. (2015). This was followed by the application of sodium acifluorfen @160 g a.i ha-1 + clodinofob propargyl @ 80 g a.i. ha-1 on 15 DAS + hand weeding on 30 DAS + Nano DAP @ 3 ml/l on 30 and 45 DAS (A4B3). The lowest number of pods plant-1 (8.01) was registered in unweed control(A1B1).

**3.7 GRAIN AND HAULM YIELD (kg ha-1)**

Among the different weed management practices, EOPE application of sodium acifluorfen @160 g a.i. ha-1 + clodinofob propargyl @ 80 g a.i. ha-1 on 15 DAS + hand weeding on 30 DAS(A4) recorded with highest grain yield with a value of 675 kg ha-1 and also higher haulm yield of 1437.33 kg ha-1 and it excelled rest of the treatments (Table 5). Effective weed management could be mainly because of an excellent suppression of all weeds right from crop emergence to harvest. This created a congenial environment similar to a weed-free situation for irrigated blackgram and improved the crop growth in terms of biomass and thus recorded superior yield attributes and yield. This was similar with finding Jagadesh and Raju (2021). This was followed by the EPOE application of imazethapyr @ 50 g a.i. ha-1 on 15 DAS + hand weeding on 30 DAS (A2). The least grain yield of 398 kg ha-1 and haulm yield of 876.66 kg ha-1 was recorded in unweed control(A1).

The different foliar nutrients applied significantly influenced the seed yield and haulm yield. Regarding various foliar nutrition applied, the highest grain yield of 606.25 kg ha-1 and haulm yield of 1301.25 kg ha-1 was recorded under the application of vermiwash @ 10 % on 30 and 45 DAS (B2). This was followed by Nano dap @ 3ml/l application on 30 and 45 DAS (B3). The least grain yield and haulm yield was recorded in control (B1) with a value of 524.25 kg ha-1 and 1149.00 kg ha-1.

 In respect of various interaction effects EPOE applications of sodium acifluorfen @160 g a.i. ha-1 + clodinofob propargyl @ 80 g a.i. ha-1 on 15 DAS + hand weeding on 30 DAS + vermiwash @ 10 % on 30 and 45 DAS (A4B2) recorded with a highest grain yield of 730 kg ha-1 and haulm yield of 1535 kg ha-1 was significantly superior over rest of the interactions The higher yield in weed control treatments could be credited to the efficient management of weeds in early growth stages providing a congenial environment for better crop growth. Moreover, the nutrient uptake of the crop plants is also increased with weed control treatments. This result was similar with Malhi *et al*. (2021). This was followed by the application of sodium acifluorfen @160 g a.i. ha-1 +clodinofob propargyl @ 80 g a.i. ha-1 on 15 DAS+ hand weeding on 30 DAS + Nano DAP @ 3 ml/l on 30 and 45 DAS (A4B3). The unweed control (A1B1) recorded a lower grain yield and haulm yield of 379 kg ha-1 and 845 kg ha-1. A significantly higher seed yield attained in these treatments was due to an efficient control of all categories of weeds, reduced weed index, higher weed control index and higher herbicide efficiency in controlling the weeds to a great extent confirming the findings of Tigga *et al.* (2018) in blackgram.

**4. CONCULSION**

 It can be concluded that effects EPOE applications of sodium acifluorfen @160 g a.i. ha-1 + clodinofob propargyl @ 80 g a.i. ha-1 on 15 DAS + hand weeding on 30 DAS (A4) and vermiwash @ 10 % on 30 and 45 DAS (B2) resulted with highest growth rate and yield attributes and yield in summer irrigated blackgram.

|  |
| --- |
| **Plant Height (cm)** |
| FoliarNutritionWeedManagement | **30 DAS** | **60 DAS** |
| B1 | B2 | B3 | MEAN | B1 | B2 | B3 | MEAN |
| A1 | 20.80 | 22.89 | 22.69 | 22.13 | 38.10 | 41.95 | 40.13 | 40.06 |
| A2 | 25.32 | 28.98 | 29.12 | 27.81 | 44.63 | 53.27 | 51.16 | 49.69 |
| A3 | 25.01 | 28.65 | 28.04 | 27.24 | 44.31 | 49.47 | 49.21 | 47.66 |
| A4 | 26.56 | 30.66 | 29.69 | 28.97 | 46.10 | 57.53 | 55.47 | 53.03 |
| MEAN | 24.42 | 27.80 | 27.39 |  | 43.28 | 50.55 | 48.99 |  |
|  | **S.Ed** | **CD(*p*=0.05)** | **S.Ed** | **CD(*p*=0.05)** |
| A | 0.23 | 0.49 | 0.45 | 0.95 |
| B  | 0.20 | 0.42 | 0.39 | 0.82 |
| AxB | 0.40 | 0.85 | 0.78 | 1.64 |

**Table-1 Impact of Agronomic strategies on plant height of blackgram on 30 DAS and 60 DAS (cm)**

|  |
| --- |
| **(LAI)** |
| FoliarNutritionWeedManagement | **30 DAS** | **45 DAS** |
| B1 | B2 | B3 | MEAN | B1 | B2 | B3 | MEAN |
| A1 | 1.09 | 1.14 | 1.11 | 1.11 | 1.35 | 1.51 | 1.44 | 1.43 |
| A2 | 1.30 | 1.76 | 1.71 | 1.59 | 2.14 | 2.62 | 2.48 | 2.41 |
| A3 | 1.30 | 1.59 | 1.47 | 1.45 | 2.03 | 2.42 | 2.30 | 2.25 |
| A4 | 1.33 | 1.93 | 1.90 | 1.72 | 2.20 | 2.86 | 2.71 | 2.59 |
| MEAN | 1.25 | 1.60 | 1.54 |  | 1.93 | 2.35 | 2.23 |  |
|  | **S.Ed** | **CD(*p*=0.05)** | **S.Ed** | **CD(*p*=0.05)** |
| A | 0.03 | 0.08 | 0.04 | 0.10 |
| B  | 0.02 | 0.05 | 0.03 | 0.07 |
| AxB | 0.05 | 0.11 | 0.07 | 0.15 |

**Table-2 Effect agronomic strategies on LAI on 30 and 45 DAS**

**Table-3 Impact of agronomic strategies crop dry matter production (DMP) (kg ha-1)**

|  |  |
| --- | --- |
| FoliarNutritionWeedManagement | **DMP (kg ha-1)** |
| B1 | B2 | B3 | MEAN |
| A1 | 815 | 889 | 843 | 849 |
| A2 | 1353 | 1589 | 1507 | 1483 |
| A3 | 1285 | 1519 | 1443 | 1415.66 |
| A4 | 1357 | 1752 | 1593 | 1573.33 |
| MEAN | 1207 | 1437.25 | 1346.50 |  |
|  | **S.Ed** | **CD(*p*=0.05)** |
| A | 38.84 | 80.56 |
| B  | 31.47 | 65.28 |
| AxB | 67.81 | 140.65 |

**Table-4 Effect of agronomic strategies on pod length and number of pods plant-1**

|  |  |  |
| --- | --- | --- |
| **Foliar****Nutrition****Weed****Management** | **Pod length(cm)** | **Number of pods plant-1** |
| B1 | B2 | B3 | MEAN | B1 | B2 | B3 | MEAN |
| A1 | 3.3 | 3.63 | 3.5 | 3.47 | 8.01 | 9.48 | 9.26 | 8.92 |
| A2 | 4.12 | 5.44 | 5.36 | 4.97 | 10.53 | 11.91 | 10.79 | 11.07 |
| A3 | 4.03 | 4.95 | 4.55 | 4.51 | 9.93 | 10.83 | 10.63 | 10.46 |
| A4 | 4.51 | 5.91 | 5.82 | 5.41 | 10.63 | 12.67 | 12.22 | 11.84 |
| MEAN | 3.99 | 4.98 | 4.80 |  | 9.77 | 11.22 | 10.72 |  |
|  | **S.Ed** | **CD(*p*=0.05)** | **S.Ed** | **CD(*p*=0.05)** |
| A | 0.03 | 0.08 | 0.15 | 0.33 |
| B  | 0.03 | 0.07 | 0.10 | 0.21 |
| AxB | 0.07 | 0.15 | 0.19 | 0.40 |

|  |  |  |
| --- | --- | --- |
| **Foliar****Nutrition****Weed****Management** | **Grain yield** | **Haulm Yield** |
| B1 | B2 | B3 | MEAN | B1 | B2 | B3 | MEAN |
| A1 | 379 | 405 | 410 | 398 | 845 | 895 | 890 | 876.66 |
| A2 | 570 | 655 | 645 | 623 | 1272 | 1405 | 1390 | 1355.66 |
| A3 | 553 | 635 | 612 | 600 | 1194 | 1370 | 1320 | 1294.67 |
| A4 | 595 | 730 | 700 | 675 | 1285 | 1535 | 1492 | 1437.33 |
| MEAN | 524.25 | 606.25 | 591.75 |  | 1149.00 | 1301.25 | 1273.00 |  |
|  | **S.Ed** | **CD(*p*=0.05)** | **S.Ed** | **CD(*p*=0.05)** |
| A | 9.40 | 20.57 | 12.02 | 24.94 |
| B  | 8.21 | 17.82 | 10.41 | 21.60 |
| AxB | 12.16 | 26.39 | 20.82 | 43.20 |

**Table 5. effect of Agronomic strategies on Grain and haulm yield of blackgram (kg ha-1)**

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