

EFFECT OF INORGANIC FERTILIZERS AND BIO-FERTILIZERS ON GROWTH AND YIELD OF ASALIO (*LEPIDIUM SATIVUM*)

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SUMMARY

Asalio (*Lepidium sativum* L.) is cultivated for food, feed and medicinal supplements. It is also useful to increase the milk production in animals. The field experiment was conducted using HLS-4 variety of Asalio in eleven treatments (*i.e.* T₁: N: P 80: 40 kg/ha, T₂: N: P 60: 30 kg/ha, T₃: N: P 80: 40 kg/ha + PSB, T₄: N: P 80: 40 kg/ha + Azotobactor, T₅: N: P 60: 30 kg/ha + PSB, T₆: N: P 60: 30 kg/ha + Azotobactor, T₇: N: P 40: 20 kg/ha + PSB, T₈: N: P 40: 20 kg/ha + Azotobactor, T₉: N: P 80: 40 kg/ha + PSB + Azotobactor, T₁₀: N: P 60: 30 kg/ha + PSB + Azotobactor, T₁₁: N: P 40: 20 kg/ha + PSB + Azotobactor) in RBD during *Rabi* 2017-18 and 2018-19 at Research Farm of MAP Section, Department of Genetics and Plant Breeding, CCS Haryana Agricultural University, Hisar. In the present study, During 2017-18, the maximum seed yield (1750 kg/ha), net return (Rs.36534/ha) and B:C ratio (2.3) was fetched with the application of T₉ treatment *i.e.* N: P 80: 40 kg/ha + PSB + Azotobactor. Seed yield in T₉: N: P 80: 40 kg/ha + PSB + Azotobactor was found superior to the other set of treatments but was at par with T₄: N: P 80: 40 kg/ha + Azotobactor and T₃: N: P 80: 40 kg/ha + PSB treatments. Lowest seed yield (1198 kg/ha) net return (Rs. 21616/ha) and B: C ratio (1.5) was observed with treatment T₇ *i.e.* N: P 40: 20 kg/ha + PSB. Likewise, during 2018-19, maximum seed yield (2010 kg/ha) of Asalio was recorded in T₉: N: P 80: 40 kg/ha + PSB + Azotobactor which was significantly superior to the rest of treatments except T₃: N: P 80: 40 kg/ha + PSB and T₄: N: P 80: 40 kg/ha + Azotobactor. Highest net return (Rs.44418/ha) and B: C ratio (2.80) was found with treatment T₉: N: P 80: 40 kg/ha + PSB + Azotobactor which was followed by T₄: N: P 80: 40 kg/ha + Azotobactor and T₃: N: P 80: 40 kg/ha + PSB, therefore, treatment, N: P 80: 40 kg/ha + PSB + Azotobactor has good potential for commercial cultivation.

Key words : Asalio, seed yield, contributing characters, inorganic fertilizers, bio-fertilizers

Asalio (*Lepidium sativum* L.) is a herbaceous annual crop plant and belongs to family Brassicaceae. It was found native to Ethiopia and introduced in Asia, Europe and USA. In India, it is grown in patches in UP, MP, Rajasthan, Gujarat and Maharastra (Choudhary *et al.*, 2010; Arya and Vandana, 2018). It is mainly cultivated for food, feed and medicinal purposes. In addition to energy, Asalio seeds are rich in folic acid, vitamin A & C and minerals (Fe & Ca) (Kumari, 2013). Its seeds have high oil content (26.4%) with desirable levels of linolenic acid, high protein content (30.6%) with very high proportion of globulin (31.2%) and gluteline (29.3%). In vitro digestibility of protein was found 62.5%. The sweet taste of seed was due to presence of high total soluble sugars (6.4%) (Patel, 1997). Asalio seeds are good tonic when given for feeding to the lactating animals, mainly after calving to meet the strain and drain of calving for first two weeks

along with bajra grain, wheat brawn, methi, ginger, kalijiri, jiggery and oil. According to Paranjape and Mehta (2004), Asalio is useful traditional tonic to increase height of children and also used as tonic for eyes. It is also useful to increase the milk production in animals.

Moreover, the population of milch animals is still increasing, but their productivity is depliting due to poor quality and limited quantity of fodders (Sharma, 2014). It is true in case of dairy farming, where consistent supply of green fodder is imperative to sustain milk production (Somashekar *et al.*, 2014). Deficiency in feed and fodder has been identified as one of major components in achieving the desirable level of dairy animal's production (Kumar *et al.*, 2012). Therefore, keeping the requirement of nutritional quality feed/fodder and health of animals in view, Asalio could be utilized as animal feed/fodder to increase the milk production.

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Management practices plays very important role to obtain maximum yield and monetary benefits. But, a very little research work has been done in this direction to develop an effective production technique in Asalio, therefore, the present study on the effect of different doses of chemical fertilizers and bio-fertilizers in different combinations on growth and yield of Asalio was carried out.

MATERIALS AND METHODS

The field experiment was conducted by using HLS-4 variety of Asalio, in eleven treatments (i.e. T₁: N: P 80: 40 kg/ha, T₂: N: P 60: 30 kg/ha, T₃: N: P 80: 40 kg/ha + PSB, T₄: N: P 80: 40 kg/ha + Azotobactor, T₅: N: P 60: 30 kg/ha + PSB, T₆: N: P 60: 30 kg/ha +

Azotobactor, T₇: N: P 40: 20 kg/ha + PSB, T₈: N: P 40: 20 kg/ha + Azotobactor, T₉: N: P 80: 40 kg/ha + PSB+ Azotobactor, T₁₀: N: P 60: 30 kg/ha + PSB+ Azotobactor, T₁₁: N: P 40: 20 kg/ha + PSB + Azotobactor) in RBD during *Rabi* 2017-18 and 2018-19 at Research Farm of MAP Section, Department of Genetics and Plant Breeding, CCS Haryana Agricultural University, Hisar located 29° 10' N latitude and 75° 46' E longitude with an elevation of 215.2m above the mean sea level. Weekly weather parameters data was recorded during 2017-18 (Fig. 1). The soil of Hisar was found sandy loam (Typic Ustochrepts), tested medium in organic carbon (0.046%), available nitrogen (191kg/ha) and phosphorus (14kg/ha) and high in available potassium (340kg/ha). Weather parameters data recorded during cropping season, *Rabi*

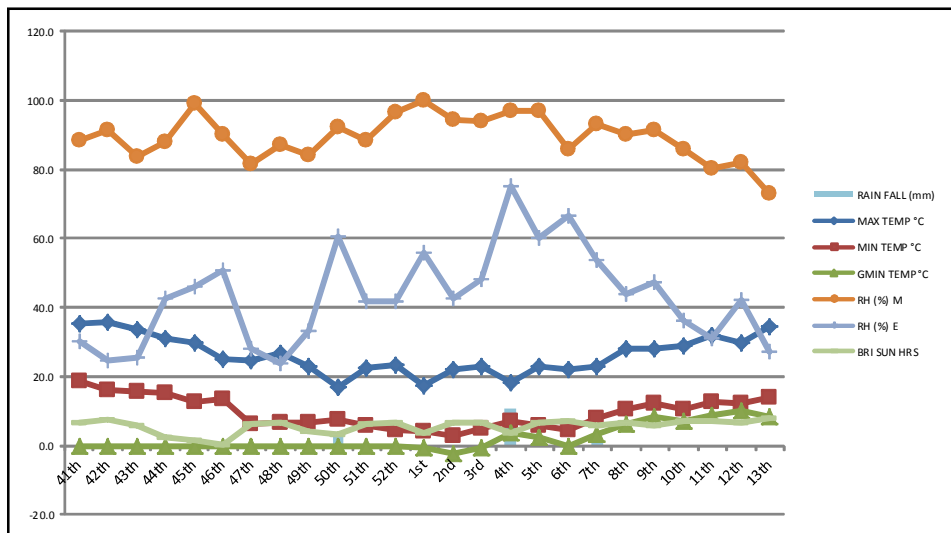


Fig. 1. Weekly weather parameters data recoded during 2017-18.

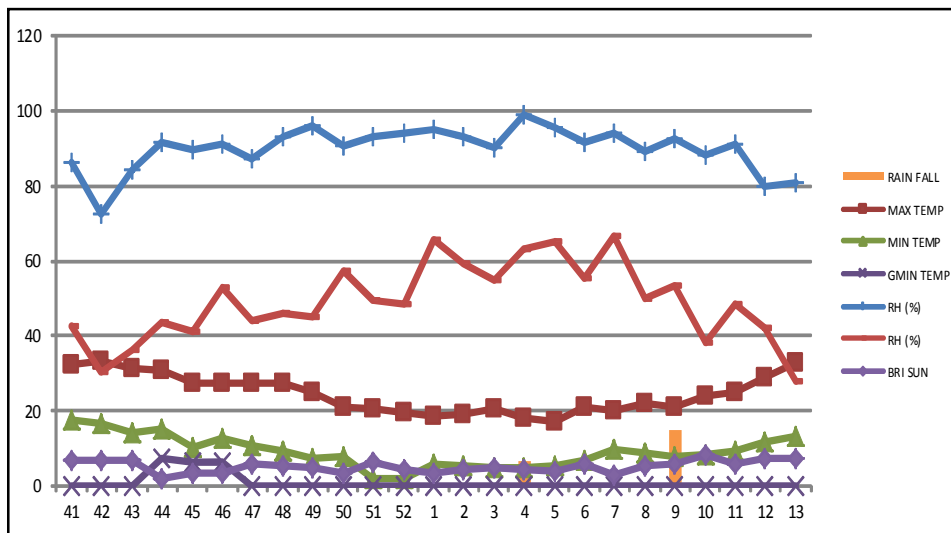


Fig. 2. Weekly weather parameters data recoded during 2018-19.

2017- 18 and 2018-19is presented in Fig.1 & 2. Each treatment was planted in six rows of four meter length spacing 30cm apart to each other in three replications in RBD. All the recommended package of practices was carried out to raise a good crop. Data were recorded on five randomly selected plants for branches per plant, pods per plant, seed yield (kg/ha), net return (Rs.) and B: C ratio. The data were subjected was subjected statistical analysis as per standard procedure.

RESULTS AND DISCUSSION

During 2017-18, Field experiment was conducted to study the effect of various doses of chemical fertilizers (N: P) and bio-fertilizers in different combinations on growth and yield of Asalio. Observations presented in Table 1 revealed that

significantly higher number of branches per plant (16.5) was recorded with the application of T₉ i.e.; N: P 80: 40 kg/ha + PSB + AZB which was statistically at par with T₄ i.e.; N: P 80: 40 kg/ha +AZB, T₁ i.e.; N: P 80: 40 kg/ha and T₃ i.e.; N: P 80: 40 kg/ha + PSB. Lowest number of branches per plant (10.9) was recorded in T₇ i.e.; P 40: 20 kg/ha + PSB. Higher number of pods per plant (1126.6, 1056.6, 1045.5, and 1030.3) was registered with T₉, T₃, T₄ and T₁, respectively and significantly superior to the other treatments. Lowest number of pods per plant (700.4) was observed in T₇. Maximum seed yield (1750 kg/ha), net return (Rs.36534/-) and B: C ratio (2.3) was fetched with the application of T₉ treatment i.e. N: P 80: 40 kg/ha + PSB + AZB. Seed yield (T₉) was found superior to the other set of treatments but was at par with T₄ and T₃ treatments. Lowest seed yield (1198

TABLE 1
Growth and yield of Asalio as affected by different dose of chemical and bio-fertilizers

| Treatments | No. of branches/ plant | | | No. of pods/plant | | |
|---|------------------------|-------------|-------------|-------------------|---------------|---------------|
| | 2017-18 | 2018-19 | Mean | 2017-18 | 2018-19 | Mean |
| T ₁ : N : P 80 : 40 kg/ha | 14.9 | 17.6 | 16.2 | 1030.3 | 1098.0 | 1064.1 |
| T ₂ : N : P 60 : 30 kg/ha | 11.9 | 15.5 | 13.7 | 848.1 | 884.9 | 866.5 |
| T ₃ : N : P 80 : 40 kg/ha+PSB | 14.7 | 18.4 | 16.5 | 1056.6 | 1164.9 | 1110.7 |
| T ₄ : N : P 80 : 40 kg/ha+Azotobactor | 15.8 | 19.1 | 17.4 | 1045.5 | 1193.7 | 1119.6 |
| T ₅ : N : P 60 : 30 kg/ha+PSB | 12.5 | 16.0 | 14.2 | 916.7 | 889.8 | 903.2 |
| T ₆ : N : P 60 : 30 kg/ha+Azotobactor | 12.8 | 17.3 | 15.0 | 920.6 | 978.8 | 949.7 |
| T ₇ : N : P 40 : 20 kg/ha+PSB | 10.9 | 11.5 | 11.2 | 700.4 | 769.2 | 734.8 |
| T ₈ : N : P 40 : 20 kg/ha+Azotobactor | 11.0 | 14.4 | 12.7 | 745.2 | 854.4 | 799.8 |
| T ₉ : N : P 80 : 40 kg/ha+PSB+Azotobactor | 16.5 | 21.1 | 18.8 | 1126.6 | 1309.0 | 1217.8 |
| T ₁₀ : N : P 60 : 30 kg/ha+PSB+Azotobactor | 13.3 | 17.5 | 15.4 | 961.8 | 1023.6 | 992.7 |
| T ₁₁ : N : P 40 : 20 kg/ha+PSB+Azotobactor | 11.4 | 14.6 | 13.0 | 714.3 | 766.2 | 740.2 |
| S. Em± | 0.9 | 0.97 | | 52.1 | 44.6 | |
| C. D. (P=0.05) | 2.7 | 2.88 | | 154.7 | 132.4 | |

Conti....

| Treatments | Seed yield (kg/ha) | | | Net return (Rs./ha) | | | B : C ratio | | |
|---|--------------------|-------------|-------------|---------------------|--------------|--------------|-------------|-------------|-------------|
| | 2017-18 | 2018-19 | Mean | 2017-18 | 2018-19 | Mean | 2017-18 | 2018-19 | Mean |
| T ₁ : N : P 80 : 40 kg/ha | 1584 | 1665 | 1624 | 31629 | 34067 | 32848 | 2.00 | 2.14 | 2.07 |
| T ₂ : N : P 60 : 30 kg/ha | 1361 | 1396 | 1378 | 25740 | 26785 | 26262 | 1.70 | 1.77 | 1.74 |
| T ₃ : N : P 80 : 40 kg/ha+PSB | 1618 | 1805 | 1711 | 32619 | 38267 | 35443 | 2.10 | 2.41 | 2.26 |
| T ₄ : N : P 80 : 40 kg/ha+Azotobactor | 1724 | 1896 | 1810 | 35804 | 41002 | 38403 | 2.30 | 2.58 | 2.44 |
| T ₅ : N : P 60 : 30 kg/ha+PSB | 1379 | 1316 | 1347 | 26235 | 24385 | 25310 | 1.70 | 1.62 | 1.66 |
| T ₆ : N : P 60 : 30 kg/ha+Azotobactor | 1408 | 1474 | 1441 | 27115 | 29125 | 28120 | 1.80 | 1.93 | 1.87 |
| T ₇ : N : P 40 : 20 kg/ha+PSB | 1198 | 1290 | 1244 | 21616 | 24392 | 23004 | 1.50 | 1.70 | 1.60 |
| T ₈ : N : P 40 : 20 kg/ha+Azotobactor | 1218 | 1372 | 1295 | 22196 | 26852 | 24524 | 1.50 | 1.88 | 1.69 |
| T ₉ : N : P 80 : 40 kg/ha+PSB+Azotobactor | 1750 | 2010 | 1880 | 36534 | 44418 | 40476 | 2.30 | 2.80 | 2.55 |
| T ₁₀ : N : P 60 : 30 kg/ha+PSB+Azotobactor | 1421 | 1490 | 1455 | 27465 | 29605 | 28535 | 1.80 | 1.96 | 1.88 |
| T ₁₁ : N : P 40 : 20 kg/ha+PSB+Azotobactor | 1318 | 1386 | 1352 | 25166 | 27272 | 26219 | 1.70 | 1.91 | 1.81 |
| S. Em± | 55.3 | 69.74 | | - | - | | - | - | |
| C. D. (P=0.05) | 164 | 207.18 | | - | - | | - | - | |

kg/ha) net return (Rs. 21616/-) and B: C ratio (1.5) was observed with treatment T₇ i.e. N: P 40: 20 kg/ha + PSB.

During 2018-19, Field experiment was conducted to study the effect of various doses of chemical fertilizers (N: P) and bio-fertilizers in different combinations on growth and yield of Asalio. Data presented in Table 1 revealed that number of branches per plant (21.1) was found highest with treatment T₉ which was statistically at par with T₄ and T₃. Higher number of pods per plant (1309) was observed in T₉ and it was significantly superior to the all other treatments except T₄. Maximum seed yield (2010 kg/ha) of Asalio was recorded in T₉ which was significantly superior to the rest of treatments except T₃ and T₄. Highest net return (Rs.44418/-) and B: C ratio (2.80) was found with treatment T₉ which was followed by T₄ and T₃ (Table 1).

The average over both the years revealed that higher number of branches per plant (18.8) was recorded with the application of T₉ i.e.; N: P 80: 40 kg/ha + PSB + AZB which was followed by T₄ i.e.; N: P 80: 40 kg/ha + Azotobactor (17.1), and T₃ i.e.; N: P 80: 40 kg/ha + PSB (16.5). Over the years, average maximum seed yield (1880 kg/ha), net return (Rs. 40476/-) and B: C ratio (2.55) was fetched with the application of T₉ treatment i.e. N: P 80: 40 kg/ha + PSB + Azotobactor. The enhancement in seed yield may be due to better nutrient availability and favourable effect of soil physical and biological properties resulting in increased growth and yield attributes and finally higher seed yield. Seed yield in T₉; N: P 80: 40 kg/ha + PSB+ Azotobactor was found superior to the other set of treatments but was at par with T₄ and T₃ treatments. The increase in seed yield was found increasing with the increase of fertilizer doses as well as application of PSB + Azotobactor also contributed to increase the seed yield of Asalio. Likewise, Praneeth *et al.*, (2018) recommended combined application of FYM + 75% NPK + Azotobacter + PSB. The seed yield of crop variety is the combined reflection of contributing components, which depends on plant phenology, crop management along with environmental conditions (Arya and Vandana, 2018). The integrated nutrient management through organic, inorganic and biofertilizers sources is gaining importance in modern agriculture by reducing usage of chemical fertilizers, which improves soil fertility, productivity and quality produce.

Moreover, Asalio is an important medicinal plant needs attention from the point of medicinal value to enhance growth and yield.

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