International Journal of Agriculture and Animal Production
ISSN: 2799-0907
Vol : 03 , No. 01 , Dec 2022 - Jan 2023
http://journal.hmjournals.com/index.php/IJAAP
DOI: https://doi.org/10.55529/ijaap.31.1.9

Influence of Zinc Sulphate and Potassium Nitrate on Morpho-Physiological Parameters, Yield and Yield Attributes of Lathyrus

Minakshi Khemraj Wadhai[1*], P. V. Shende[2], N. P. Badhe[3], S. S. Pokale[4]

[1,3,4]P.G. Students, Botany Section, College of Agriculture, Nagpur*
[2]Associate Professor, Botany Section, College of Agriculture, Nagpur

Corresponding Email: [1]minakshiwadhai10@gmail.com*

Received: 19 August 2022 **Accepted:** 01 November 2022 **Published:** 03 December 2022

Abstract: ***A field experiment was conducted during rabi 2021-22, to study the influence of zinc sulphate and potassium nitrate on morpho-physiological parameters, yield and yield contributes of lathyrus cv. Ratan. The experiment was laid down in randomized block design with nine treatments and three replications at research farm of Botany Section College of Agriculture, Nagpur. The aim of this work was to study the effect of foliar application of zinc sulphate at 0.25, 0.50, 0.75 and 1% and potassium nitrate at 0.20, 0.40, 0.60 and 0.80% on biochemical parameters and yield in lathyrus. Spraying of zinc suphate and potassium nitrate was done two times i.e. on 20 and 40 DAS. Observations about morpho-physiological parameters like plant height, number of branches, total dry matter production and leaf area were also estimated. Observation on yield contributing parameters like 100 seed weight (g), number of pods plant^{-1}, grain yield plant^{-1}, plot^{-1}, ha^{-1}, harvest index recorded. Foliar sprays of 0.80% KNO_3 followed by 0.60% KNO_3 significantly enhanced biochemical parameters and yield contributing parameters when compared with control and rest of the treatments under study.***

Keywords: Lathyrus, Znso4, KNO3, Micronutrients, Foliar Spray, Morpho-Physiological Parameters.

1. INTRODUCTION

Lathyrus sativus, also known as grass pea, cicerchia, blue sweet pea, chickling pea, chickling vetch, Indian pea, white pea and white vetch, is a legume (family Fabaceae)commonly grown for human consumption and livestock feed in Asia and East Africa. It is a particularly important crop in areas that are prone to drought and famine, and is thought of as an 'insurance crop' as it produces reliable yields when all other crops fail.

The edible Lathyrus sativus originated in the West Central Asia Mediterranean region and

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North India was its centre of domestication. The states which cultivate lathyrus are Maharashtra, Madhya Pradesh, Bihar, West Bengal and Eastern Uttar Pradesh contributing about 4.5% total pulse production of the country. In Maharashtra it is cultivated in Bhandara, Chandrapur, Gadchiroli, Gondia and Nagpur districts of eastern Vidarbha.

Zinc sulphate is the inorganic compound with equation $ZnSO_4$. It was generally known as "white vitriol". It is a powder that is colourless and totally water solvent. It is a fundamental part of catalysts engaged with metabolic reaction. Zinc sulphate is most ordinarily utilized source of zinc in granular fertilizer due to its high solvency in water and it is relatively low cost of production. They are responsible for use in a wide range of soils. It influences a few biochemical cycles in the plant, like cytochrome and nucleotide synthesis, chlorophyll production, enzyme activation, membrane integrity and hormone regulation (e.g., Tryptophan synthesis, a precursor of IAA).Sulphur assumes urgent part in controlling metabolic and enzymatic cycles including photosynthesis, respiration and legume rhizobium symbiotic nitrogen fixation, energy transformation, activation of enzymes and also in carbohydrate metabolism which reflected in expanded yield. (Nalini et al., 2013).

Potassium is known to be taken up by plant roots at high rates and is quickly transported to the upper plant parts. The downward transport of K from tops to roots is also a rapid process, so that once K is absorbed, it is readily distributed throughout the entire plant.K is taken up from the soil solution by root epidermal and cortical cells. Once K is inside the root symplast, it may be sorted in vacuoles, where it fulfills osmotic functions, or is transported to the shoot via xylem (Pardo and Rubio, 2011).

2. MATERIAL AND METHODS

The project entitled “influence of zinc sulphate and potassium nitrate on morpho-physiological parameters, yield and yield contributes of lathyrus” was conducted during rabi season 2021-22 at research farmof Botany Section College of Agriculture, Nagpurin a Randomized Block Design with nine treatments and three replications. Treatment consists ofT_1 (control), T_2 ($ZnSO_4$ 0.25%), T_3 ($ZnSO_4$ 0.50%), T_4 ($ZnSO_4$ 0.75%), T_5 ($ZnSO_4$ 1.0%), T_6 (KNO_3 0.20%), T_7 (KNO_3 0.40%), T_8 (KNO_3 0.60%) and T_9 (KNO_3 0.80%) were tested. The gross plot size was 2.70 m x 2.20 m and net plot size was 2.10 m x 2.00 m with spacing of 30 cm x 10 cm. Five plants from each plot were selected randomly and data were collected at 25, 45 and 65 DAS on plant height, number of branches, total dry matter production and leaf area were calculated. Test weight, number pods, grain yield plant^{-1}, plot^{-1}, ha^{-1}, harvest index were calculated after harvest. Data was estimated by to statastical analysis as per method suggested by Panse and Sukhatme (1958).

3. RESULTS AND DISCUSSION

Plant Height

The data regarding the plant height at 25 DAS were found statistically significant. At 25 DAS the range of plant height was recorded 7.08 – 9.54 cm. Significantly maximum plant height was registered in treatment T_9 (KNO_3 0.80%) followed by treatments T_8 (KNO_3 0.60%), T_5 ($ZnSO_4$ 1.0%), T_4 ($ZnSO_4$ 0.75%), T_7 (KNO_3 0.40%) and T_6 (KNO_3 0.20%) over control and rest of the treatments. Whereas the treatments T_3 ($ZnSO_4$ 0.50%) and T_2 ($ZnSO_4$

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0.25%) in descending order also found significantly superior over treatments over T_1 control. At 45 DAS the range of plant height was recorded 17.06 – 25.22 cm. At this stage significantly highest plant height was noticed in plant expose to the treatment T_9 (KNO_3 0.80%) followed by treatments T_8 (KNO_3 0.60%), T_5 ($ZnSO_4$ 1.0%), T_4 ($ZnSO_4$ 0.75%), T_7 (KNO_3 0.40%) and T_6 (KNO_3 0.20%) over control (T_1). Next to these treatments significantly more plant height was also recorded in treatments T_3 ($ZnSO_4$ 0.50%) and T_2 ($ZnSO_4$ 0.25%) were found at par with control.

At 65 DAS the range of plant height was observed 34.11 - 52.69 cm. The significantly superior plant height was registered in treatment T_9 (KNO_3 0.80%) followed by treatments T_8 (KNO_3 0.60%), T_5 ($ZnSO_4$ 1.0%), T_4 ($ZnSO_4$ 0.75%), T_7 (KNO_3 0.40%) and T_6 (KNO_3 0.20%), over control and rest of the treatments. Whereas the treatments T_3 ($ZnSO_4$ 0.50%) and T_2 ($ZnSO_4$ 0.25%) were found significant over treatment T_1 control.

. Similar result were observed by Rautet al. (2019) examined the effect of zinc as a foliar application on chickpea and recorded significant increase in plant height by the application of 0.5% $ZnSO_4$. Karadet al. (2021) observed that influence of ferrous sulphate and zinc sulphate on morpho-physiological parameters and yield in chickpea and recorded maximum height in 0.5 % $ZnSO_4$. Almost similar result were reported by Kumar et al. (2022) that effect of potassium level on performance of chickpea and recorded maximum height in level 90 kg potassium ha $^{-1}$. Whereas, Monga and Kumar (2022) observed that the foliar application of KNO_3 @ 2% showed maximum plant height.

Number of Branch

At 25 DAS data recorded about number of branches plant-1 was statistically significant. At 25DAS range of number of branches plant^{-1} recorded was 3.35 – 4.62. Significantly highest number of branches plant^{-1} was recorded in treatment T_9 (KNO_3 0.80%) followed by treatments T_8 (KNO_3 0.60%), T_5 ($ZnSO_4$ 1.0%), T_4 ($ZnSO_4$ 0.75%) and T_7 (KNO_3 0.40%) and over control and rest of the treatments. Whereas the treatments T_6 (KNO_3 0.20%), T_3 ($ZnSO_4$ 0.50%) and T_2 ($ZnSO_4$ 0.25%) were found at par with control.

At 45 DAS range of number of branches plant^{-1} recorded was 5.23 – 7.28. At 45 DAS significantly highest number of branches plant^{-1} was observed in treatment T_9 (KNO_3 0.80%) followed by treatments T_8 (KNO_3 0.60%), T_5 ($ZnSO_4$ 1.0%) and T_4 ($ZnSO_4$ 0.75%) as compared with control (T_1). Next to these treatments significantly more plant height was also recorded in treatments T_7 (KNO_3 0.40%), T_6 (KNO_3 0.20%) T_3 ($ZnSO_4$ 0.50%) and T_2 ($ZnSO_4$ 0.25%) were found at par with control.

At 65 DAS range of number of branches plant^{-1} recorded was 6.05 – 9.02. At 65 DAS significantly maximum number of branches plant^{-1} was registered in treatment T_9 (RDF + KNO_3 0.80%) followed by treatments T_8 (KNO_3 0.60%), T_5 ($ZnSO_4$ 1.0%), T_4 ($ZnSO_4$ 0.75%), T_7 (KNO_3 0.40%), T_6 (KNO_3 0.20%) and T_3 ($ZnSO_4$ 0.50%) over control and rest of the treatments. But, treatment T_2 ($ZnSO_4$ 0.25%) were found at par with control.

The marked superiority in growth parameters like branches observed due to potassium which enhances plant vigour and strengthens the stalk.

Theoneste et al. (2018) investigate the response of different potassium application rates on growth, yield, carbohydrates and protein content of mungbean. K_4 (0.5g /pot) significantly enhanced the number of branches plant^{-1} in mungbean. Whereas Laishramet al.

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(2020) revealed that the foliar spray of KNO_3 (2%) enhanced the number of branches plant^{-1} in lentil.Almost similar result were reported by Kumar et al. (2022) that effect of potassium level on performance of chickpea and recorded maximum number of branches plant^{-1} in level 90 kg potassium ha $^{-1}$. However, Karadet al. (2021) observed that influence of ferrous sulphate and zinc sulphate on morpho-physiological parameters and yield in chickpea and recorded maximum number of branches plant^{-1} in 0.5 % $ZnSO_4$.

Total Dry Matter Production

Scrutiny of the data revealed marked effect of foliar spray of $ZnSO_4$ and KNO_3 on the total dry matter production of lathyrus at 25, 45 and 65 DAS.

The data recorded about the total dry matter production were found statistically significant at 25 DAS. The range of dry matter production recorded was 0.44 – 0.75 g. Significantly maximum dry matter production was noticed in treatment T_9 (KNO_3 0.80%) followed by treatments T_8 (KNO_3 0.60%), T_5 ($ZnSO_4$ 1.0%), T_4 ($ZnSO_4$ 0.75%) T_7 (KNO_3 0.40%) and T_6 (KNO_3 0.20%) when compared with treatment T_1 (control). Next to these treatments significantly more dry matter production was also recorded in treatments T_3 ($ZnSO_4$ 0.50%) and T_2 ($ZnSO_4$ 0.25%) were found at par with control.

At 45 DAS the range of total dry matter production recorded was 1.35 – 1.78 g. Significantly maximum dry matter production was registered in treatment T_9 (KNO_3 0.80%) followed by treatments T_8 (KNO_3 0.60%), T_5 ($ZnSO_4$ 1.0%), T_4 ($ZnSO_4$ 0.75%) T_7 (KNO_3 0.40%) and T_6 (KNO_3 0.20%), over control and rest of the treatments. Next to these treatments significantly more dry matter production was also recorded in treatments T_3 ($ZnSO_4$ 0.50%) and T_2 ($ZnSO_4$ 0.25%) were found at par with control.

At 65 DAS the range of total dry matter production recorded was 4.45 - 6.66 g. significantly maximum dry matter production was registered in treatment T_9 (KNO_3 0.80%) followed by treatments T_8 (KNO_3 0.60%), T_5 ($ZnSO_4$ 1.0%), T_4 ($ZnSO_4$ 0.75%) T_7 (KNO_3 0.40%), T_6 (KNO_3 0.20%) and T_3 ($ZnSO_4$ 0.50%) over control. Next to these treatments significantly more dry matter production was also noticed in treatments and T_2 ($ZnSO_4$ 0.25%) were found at par with control.

Similar result recorded by Laishramet al. (2020) who revealed that the foliar spray of KNO_3 (2%) enhanced the dry matter production in lentil.Whereas Mate et al. (2020) who reported that application of foliar application of $ZnSO_4$ 0.5% was found more effective in increasing the total dry matter production, when compared with control in lathyrus. Also Karadet al. (2021) observed that influence of ferrous sulphate and zinc sulphate on morpho-physiological parameters and yield in chickpea and recorded maximum total dry matter production in 0.5 % $ZnSO_4$.Almost similar result were reported by Kumar et al. (2022) that effect of potassium level on performance of chickpea and recorded increasedtotal dry matter production in level 90 kg potassium ha $^{-1}$.

Leaf Area Plant^{-1}

Data pertaining to leaf area plant^{-1} at 25, 45 and 65 DAS as influenced by different treatments was tabulated in table 8 and graphically depicted in figure 8. Leaf area plant^{-1}gradually increased from 20 DAS and reached maximum value at 60 DAS in all the treatments.

Observations recoded at 25 DAS indicated significant variation. At 25 DAS the range of leaf area plant^{-1} recorded was 0.55 – 0.81 dm^2. The most pronounced effect

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observed in plant expose to the treatment T_9 (KNO_3 0.80%) followed by treatments T_8 (KNO_3 0.60%), T_5 ($ZnSO_4$ 1.0%), T_4 ($ZnSO_4$ 0.75%), T_7 (KNO_3 0.40%) and T_6 (KNO_3 0.20%), in leaf area over control and rest of the treatments under study. Next to these treatments significantly more Leaf area was also recorded in treatments T_3 ($ZnSO_4$ 0.50%) and T_2 ($ZnSO_4$ 0.25%) were found at par with control.

At 45 DAS the range leaf area plant^{-1} recorded was 1.39 – 1.80 dm^2. The significantly highest leaf area over control was observed at 45 DAS in treatment T_9 (KNO_3 0.80%) followed by treatments T_8 (KNO_3 0.60%), T_5 ($ZnSO_4$ 1.0%), T_4 ($ZnSO_4$ 0.75%), T_7 (KNO_3 0.40%) and T_6 (KNO_3 0.20%) in a descending manner. But treatments T_3 ($ZnSO_4$ 0.50%) and T_2 ($ZnSO_4$ 0.25%) were found at par with control.

At 65 DAS the range of leaf area plant^{-1} recorded was 3.22 – 4.57 dm^2. At 65 DAS significantly highest leaf area was registered in treatment T_9 (KNO_3 0.80%) followed by treatments T_8 (KNO_3 0.60%), T_5 ($ZnSO_4$ 1.0%), T_4 ($ZnSO_4$ 0.75%), T_7 (KNO_3 0.40%) and T_6 (KNO_3 0.20%) over control and rest of the treatments under study. Next to these treatments significantly more Leaf area was also recorded in a treatment T_3 ($ZnSO_4$ 0.50%) and T_2 ($ZnSO_4$ 0.25%) were found at par with control.

Similar results were reported by Gowthami and Ananda N (2017) studied the effect of Zinc and Iron fortification on growth, pod yield, zinc uptake of groundnut genotypes. The application of 0.5% $ZnSO_4$ significantly leaf area at harvest. Whereas Piseet al. (2019), who reported that application of RDF + foliar application of $ZnSO_4$ 0.5% was found more effective in enhancing leaf area, when compared with control in lathyrus.Our results are in line with that of Rautet al. (2019), who observed that foliar application of 0.5% zinc significantly enhanced leaf area over control in chickpea. Also Karadet al. (2021) observed that influence of ferrous sulphate and zinc sulphate on morpho-physiological parameters and yield in chickpea and recorded maximum leaf area plant^{-1} in 0.5 % $ZnSO_4$.

Test Weight

The range of test weight recorded after harvest was 2.70-3.86 g. Significantly highest test weight content was found in T_9 KNO_3 @ 0.80% (3.86 g).

Application of zinc sulphate and potassium nitrate as foliar spray increased the seed weight due to movement of nutrients in plants for redistribution of minerals to the grains, extend the grain filling period leading to improvement in grain weight.

According to results of Pise et al. (2019), who studied the influence of zinc and iron on morpho-physiological parameters and yield of lathyrus (Lathyrussativus L.) and stated that application of $ZnSO_4$ 0.5% foliar spray at 25 and 40 DAS recorded highest test weight over control. However, Singh and singh (2020) observed that the foliar application of 0.5% KNO_3 showed highest test weightin wheat. Almost similar result were reported by Kumar et al. (2022) that effect of potassium level on performance of chickpea and recorded maximum weight of 100 seeds in level 90 kg potassium ha^{-1}. Whereas, Monga and Kumar (2022) observed that the foliar application of 2% KNO_3 showed that the significantly highest number of grain plant^{-1} and weight of 1000 seeds in wheat.

Number of Pod Plant^{-1}

At harvest the range of number of pod plant^{-1} was observed in the range of 60.15-78.33. Significantly highest number of pod was found in T_9 KNO_3 @ 0.80% (78.33) followed

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by T_8 KNO_3 @ 0.60% (75.67) and T_7 $ZnSO_4$ @ 1% (75). The significant increase in number of pods was observed due to spraying of zinc sulphate and potassium nitrate at 25, 45 and 65 DAS.

Results regardingnumber of pods plant^{-1} by Anitha et al. (2005) found that combined spraying of 0.5% $ZnSO_4$ at 45 DAS recorded significantly higher pods plant^{-1} in cowpea. However, Nandan et al. (2018) recorded foliar spray of 0.5% Zn produced maximum number of pods plant^{-1} in chickpea. According to results of Pise et al. (2019), who studied the influence of zinc and iron on morpho-physiological parameters and yield of lathyrus (Lathyrus sativus L.) and stated that application of $ZnSO_4$ 0.5% foliar spray at 25 and 40 DAS recorded highest number of pods plant^{-1} over control. Almost similar result were reported by Kumar et al. (2022) that effect of potassium level on performance of chickpea and recorded maximum weight of 100 seeds and number of pods plant $^{-1}$ in level 90 kg potassium ha^{-1}. However, Monga and Kumar (2022) observed that the foliar application of 2% KNO_3 showed that the significantly highest number of grain plant^{-1} and weight of 1000 seeds in wheat.

seed yield plant^{-1}(g), plot^{-1} (kg) and ha^{-1}(q)

Significantly maximum seed yield plant^{-1}, plot^{-1} and hectare^{-1} were produced in treatment T_9 KNO_3 @ 0.80% followed by T_8 KNO_3 @ 0.60%, T_7 $ZnSO_4$ @ 1%, T_6 (KNO_3 0.20%), T_3 ($ZnSO_4$ 0.50%) and T_2 ($ZnSO_4$ 0.25%)over control.

The range of increase in seed yield plant^{-1}, plot^{-1} and hectare^{-1} was 2.82 g, 0.44 kg and 10.55 q in treatment T1 (control) and 4.28 g, 0.68 kg and 16.26 q in treatment T_9 KNO_3@0.80% respectively.

The above finding was in corroboration with the findings of Sarkar and Malik (2001) observed foliar spray of KNO_3 and $ZnSO_4$ on yield ascribing characters of grass pea. Foliar spray of KNO_3 at 0.50% during 50% flowering stage showed maximum values of length of pod, seeds pod^{-1} and 1000 seed weight; it was essentially better than water spray and unsprayed control. Whereas, Anitha et al. (2005) recorded that the foliar application of micronutrients like iron and zinc had significant Influence on the yield of cowpea. 0.5% $ZnSO_4$, at 45 DAS proved most effective and increased the seed yield by 43.09% when compared with control followed by combined spraying of 0.5% $ZnSO_4$, at 25 DAS (40.14%). The net return and benefit:cost ratio also followed the sam.

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Table 1. plant height, Number of branches plant^{-1}, Leaf area plant^{-1}, Total dry weight of plant (g)

Morphophysiological Analysis

Treatments	**Plant height plant^{-1}**			**Number of branches plant^{-1}**			**Leaf area plant^{-1}**			**Total dry weight of plant (g)**		
	25 DAS	**45 DAS**	**65 DAS**	**25 DAS**	**45 DAS**	**65 DAS**	**25 DAS**	**45 DAS**	**65 DAS**	**25 DAS**	**45 DAS**	**65 DAS**
T1 CONTROL	7.08	17.06	34.11	3.35	5.23	6.05	0.55	1.39	3.22	0.44	1.35	4.45
T2 $ZnSO_4$@0.25%	8.82	22.66	47.84	3.76	5.65	7.22	0.62	1.53	3.77	0.47	1.50	4.93
T3 $ZnSO_4$@0.50%	8.78	22.97	47.90	3.79	5.74	7.71	0.65	1.59	3.82	0.52	1.53	5.67
T4 $ZnSO_4$@0.75%	9.05	23.75	48.57	4.20	6.45	8.53	0.72	1.71	4.33	0.69	1.66	6.33
T5 $ZnSO_4$@1%	9.17	24.40	48.90	4.36	6.82	8.65	0.76	1.76	4.40	0.72	1.70	6.45
T6 KNO_3@0.20%	8.83	23.43	48.04	3.83	5.80	8.12	0.67	1.61	3.88	0.59	1.57	5.78
T7 KNO_3@0.40%	8.95	23.98	48.34	4.16	6.01	8.27	0.70	1.69	3.92	0.65	1.61	6.13
T8 KNO_3@0.60%	9.32	24.82	50.00	4.53	7.18	8.87	0.79	1.78	4.49	0.73	1.73	6.59
T9 KNO_3@0.80%	9.54	25.22	52.69	4.62	7.28	9.02	0.81	1.80	4.57	0.75	1.78	6.66
SE(m)	0.35	1.22	2.63	0.20	0.36	0.47	0.36	0.06	0.21	0.04	0.06	0.37
CD	1.07	3.66	7.90	0.62	1.10	1.42	0.10	0.20	0.63	0.12	0.19	1.12

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Table2.Test weight, Number of pod plant^{-1}, Seed yield plant^{-1} (g), Seed yield plot^{-1} (kg), Seed yield ha^{-1} (q) and Harvest index(%).

Treatments	Test weight (g)	Number of pod plant^{-1}	Seed yield plant^{-1} (g)	Seed yield plot^{-1} (kg)	Seed yield ha^{-1} (q)	Harvest index (%)
T1 CONTROL	2.70	60.15	2.82	0.44	10.55	30.00
T2 $ZnSO_4$@0.25%	2.80	67.00	2.90	0.46	11.36	31.77
T3 $ZnSO_4$@0.50%	2.91	68.33	3.03	0.49	11.92	32.55
T4 $ZnSO_4$@0.75%	3.53	74.37	3.92	0.60	13.31	34.01
T5 $ZnSO_4$@1%	3.68	75.00	4.03	0.62	14.89	35.95
T6 KNO_3@0.20%	2.99	70.98	3.33	0.51	12.06	32.81
T7 KNO_3@0.40%	3.36	72.63	3.68	0.57	13.18	33.75
T8 KNO_3@0.60%	3.73	75.67	4.18	0.66	15.63	37.01
T9 KNO_3@0.80%	3.86	78.33	4.28	0.68	16.26	38.61
SE(m)	**0.21**	**2.78**	**0.27**	**0.044**	**0.97**	**1.22**
CD	**0.65**	**8.36**	**0.83**	**0.13**	**2.90**	**3.68**

trend. However, Mate et al. (2020) recorded foliar feeding of zinc sulphate at 0.5% individually and in their combinations. The foliar feeding at 25 and 35 DAS showed significantly increases the seed yield plot^{-1}. Singh and Singh (2020) observed that the foliar application of 0.5% KNO_3 showed highest grain yield ha^{-1} and B:C ratio in wheat. Similar result were reported by Kumar et al. (2022) that effect of potassium level on performance of chickpea and recorded maximum seed yield plant^{-1}, seed yield ha^{-1} in level 90 kg potassium ha^{-1}. Also Monga and Kumar (2022) observed that the foliar application of 2% KNO_3 showed the significantly highest number of grain plant^{-1}, harvest index and B:C ratio in wheat.

Harvest index

Harvest index was significantly increased and was highest in treatment T_9 (KNO_3 0.80%) followed by treatments T_8 (KNO_3 0.60%), T_5 ($ZnSO_4$ 1.0%), T_4 ($ZnSO_4$ 0.75%) and T_7 (KNO_3 0.40%) over control and rest of the treatments. But, treatments T_6 (KNO_3 0.20%), T_3 ($ZnSO_4$ 0.50%) and T_2 ($ZnSO_4$ 0.25%) found at par with treatment T_1 (control). This might be due to the physiological index reflecting the percentage of assimilates mobilization

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from vegetative organs of plant into grains.

Above results are in agreement with the experimental studies of many scientists Singh and Singh (2020). The effect of foliar application of potassium nitrate on late sown wheat (Triticumaestivum L.) in mitigatingterminal heat stress revealed that the foliar application of 0.5% KNO_3 showed highest number of grain plant^{-1}, test weight, grain yield ha^{-1} and B:C ratio.Almost similar result were reported by Kumar et al. (2022) that effect of potassium level on performance of chickpea and recorded highest harvest index in level 90 kg potassium ha^{-1}.

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International Journal of Agriculture and Animal Production
ISSN: 2799-0907
Vol : 03 , No. 01 , Dec 2022 - Jan 2023
http://journal.hmjournals.com/index.php/IJAAP
DOI: https://doi.org/10.55529/ijaap.31.1.9

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