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Research Article

Growth and yield of rocket seed (*Eruca sativa* L.) under the influence of soil and foliar application of zinc at Tandojam-Pakistan

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Abstract

It was evaluated the impact of soil and foliar application of zinc on growth and yield of rocket seed. The experimental design was randomized complete block design with three replications. There were 9 treatments including control (No Zn). Soil applied Zn at 7.5 and 15 kg ha^{-1} (Sowing), Foliar applied Zn at 0.1% and 0.2% (30 and 60 days after sowing), Soil applied Zn at 7.5 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.1% and 0.2%, Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.1% and 0.2% respectively. The results demonstrated that the maximum growth and yield parameters of rocket seed were obtained by soil + foliar application methods of zinc significantly ($P<0.05$). The plots receiving soil + foliar applied Zn at 15 kg ha^{-1} + at 0.2% produced maximum plant population (41.5 m^{-2}), branches $plant^{-1}$ (15.7), pods $plant^{-1}$ (587.3), plant height (95.3 cm) and seed yield (2300.0 kg ha^{-1}). Other treatments produced more or less equal plant population, braches $plant^{-1}$, pods $plant^{-1}$, plant height and seed yield (kg ha^{-1}). In contrast, minimum growth and yield parameters were recorded in control. Hence, it is concluded that although Zn applied at higher rates either through soil or foliar resulted in higher numerical values, but integration of Soil applied Zn at 7.5 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS) was observed very economical for getting profitable yield of rocket seed because it showed non-significant results with higher rate treatments.

Keywords: Foliar application; Rocket seed; Soil application; Yield; Zinc

Introduction

Rocket seed (*Eruca sativa* L.) is an annual plant that belongs to Brassica family. The consumption of Eruca sativa as a fresh salad has been increased throughout the world and in the Mediterranean, the leaves, and

sometimes the flowers have been used [1, 2]. In the Mediterranean, it has been used, and is still used as a potent aphrodisiac in the footsteps of the ancient Greeks who used the oil from the seed as well as the leaves. In industry, Eruca seed oil is used as alternative mineral oil as a lubricant, in soap-making, in massage, medicines, cooking and salad oils. The 'cake' from the production of the oil is used for cattle feed, and as mulch in manure. The fraction high erucic acid is added to polythene and polypropylene to reduce surface friction, and in printing inks [3, 4]. Eruca sativa is cultivated especially for oil purpose in Pakistan and Nothern India. It is a low growing annual plant that anchors into the earth with its slender roots; invasive, its weed-like nature covers the ground quite quickly, preventing other weeds from growing. The plant has proven to be quite adaptive, liking light sandy, medium, heavy clay, and well drained soils [5].

Foliar application of micronutrients has proved to be one of the most important inputs to improve the crop foliage and development of healthy seed. Among micronutrients, Zn performs a pivotal role in the process of pollination. Hence, its deficiency is responsible for yield reduction. Effects of Zn deficiency and response to growth stages are reported in the many parts of the world, the shortage of Zn is a worldwide problem in human nutrition. The studies have shown that one of the effective and productive ways of improvement in cereal grain is application of Zn fertilizer either to the soil or foliar application [6]. The Zn deficiency symptoms may last throughout the growing season, its deficiency may be observed by the development of broad bands of striped tissues on each side of the midrib of the leaf [7]. The application of Zn may enhance the crop growth and yield [8] and utilization of Zn by the plants depends upon the application method [9]. The past researches proved that foliar fertilization of Zn is useful to fulfil the plant Zn requirement; and foliar Zn application immediately delivers the nutrient to the plant tissues and organs. By foliar application of Zn to leaves, the nutrients are absorbed right at the site [10]. Yang *el al.* [11] reported that *Eruca sativa* genotypes differed in yield potential and resistance against environmental conditions. Ozdener and Aydin [12] treated *Eruca sativa* with Zn different concentrations (from 0-2000 µg g^{-1}) they observed that root and shoot length, fresh and dry weight were significantly higher at 500 and 1000 µg g^{-1} Zn concentration. Rajpar [13] observed that Zn application at higher rates significantly increase seed yield ha^{-1} and oil content percentage in mustard. Mandal and Sinha [14] reported significant improvement in growth and yield parameters of oilseed mustard due to higher $ZnSO_4$ application. Abdalla [15] reported that the rocket plants responded efficiently to the sprayed nutrients solution as compared to the control plants. It has also been reported tht NaCl decreases Eruca Sativa growth and yield [16]. The previous studies have not been found on the foliar and soil application of Zn on the rocket seed. Therefore, prerequisite to assess the impact of of soil and foliar application on growth and yield of rocket seed.

Materials and methods

Present study has been carried out during 2013-14 at Oilseeds Section, Agriculture Research Institute Tandojam, Pakistan. The experimental field was arranged in RCBD with three replications having plot size 5 m x 4 m. The rocket seeds were sown by hand drill in single row at 45 cm distance. The recommended seed rate 5 kg ha^{-1} was sown in all treatments. The local variety of rocket seed was used in experiment. Nine treatments were used; T_1 = No Zn (Control)

and T_2, T_3, T_4 and T_5 = Soil applied Zn at 7.5, 15 kg ha^{-1} (Sowing), Foliar applied Zn at 0.1% (30 and 60 DAS), at 0.2% (30 and 60 DAS) and T_6, T7, T8 and T9 Soil applied Zn at 7.5 kg ha^{-1} (Sowing) + Foliar applied Zinc at 0.1% (30 and 60 DAS), at 7.5 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS), Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.1% (30 and 60 DAS), T_9 = Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS) respectively.

Fertilizer and irrigation application

For preparation of solution for foliar application, $ZnSO_4 7H_2O$ (21.0% Zn) was used. The recommended dose of NPK fertilizer was also used in the experimental plots.

All P and K alongwith 1/3 of N was applied at the time of sowing, while remaining N was divided into two equal splits and was applied at booting and milky stages. Two foliar sprays of Zn were applied as per the treatment plan. Two irrigations were applied during the whole crop life. The 1st irrigation was applied at the interval of 30 days after sowing (DAS) and the 2nd irrigation was applied at 60 days after sowing (DAS). The weeds were also removed before irrigating the crop. At mature level the plants were harvested and were observed for agronomical and yield parameters

Statistical analysis

The collected data were subjected to ANOVA technique using Statistix 8.1 computer software (Statistix, 2006). The HSD test was applied to compare treatment means superiority, where necessary.

The data regarding rocket seed has been presented in tables 1-5 including, plant population (m^{-2}), branches $plant^{-1}$, pods $plant^{-1}$, plant height (cm), and seed yield (kg ha^{-1}).

Results

Plant population (m^{-2})

The results regarding crop population (m^{-2}) of rocket seed as affected by soil and foliar application methods of Zn are presented in table 1.

The results suggested that various Zn application methods revealed significant ($P<0.05$) effect on the plant population (m^{-2}) of rocket seed. It is glaring from the results that the highest plant population (41.5 m^{-2}) was observed in plots where Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar was applied Zn at 0.2% (30 and 60 Days After Sowing DAS), closely followed by plots where Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.1% (30 and 60 DAS and Soil applied Zn at 7.5 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS) resulted in plant population of 40.7 and 40.0 m^{-2}, respectively. The plant population was recorded 40.3, 41.3, 41.0, 40.3 and m^{-2} when the rocket seed crop was fertilized with Soil applied Zn at15 kg ha^{-1} (Sowing), Soil applied Zn at 7.5 kg ha^{-1} (Sowing)+Foliar applied Zn at 0.1% (30 and 60 DAS), Soil applied Zn at 7.5 kg ha^{-1} (Sowing), Foliar applied Zn at 0.2% (30 and 60 DAS) and Foliar applied Zn at 0.1% (30 and 60 DAS), respectively. However, in control the plant population 38.3 m^{-2} was noticed less. The statistical results indicated that the differences amongst Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS), Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.1% (30 and 60 DAS and Soil applied Zn at 7.5 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS) were non-significant ($P>0.05$).

Table 1. Effect of soil and foliar applied Zn on plant population (m^{-2}) of rocket seed

Treatments	Mean
No Zn (Control)	**38.3**
Soil applied Zn at 7.5 kg ha^{-1} (Sowing)	**41.0**
Soil applied Zn at 15 kg ha^{-1} (Sowing)	**41.3**
Foliar applied Zn at 0.1%	**38.4**
Foliar applied Zn at 0.2%	**40.3**
Soil applied Zn at 7.5 kg ha^{-1} (Sowing) + foliar applied Zn at 0.1%	**40.3**
Soil applied Zn at 7.5 kg ha^{-1} (Sowing) + foliar applied Zn at 0.2%	**40.0**
Soil applied Zn at 15 kg ha^{-1} (Sowing) + foliar applied Zn at 0.1%	**40.7**
Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2%	**41.5**

Branches plant^{-1}

The results regarding branches plant-1 of rocket seed as affected by soil and foliar application methods of Zn are presented in table 2.

The results suggested that various Zn application methods exhibited significant ($P<0.05$) effect on the branches plant^{-1} of rocket seed. It is clear from the results that highest branches 15.7 plant^{-1} was recorded in plots receiving Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS), closely followed by plots fertilized with Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.1% (30 and 60 DAS and Soil applied Zn at 7.5 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS) resulting in branches plant^{-1} of 15.1and 15.0, respectively. The branches plant^{-1} showed a declining trend with 12.3, 12.2, 11.9, 11.7 and 11.5 when the rocket seed crop was fertilized with Soil applied Zn at15 kg ha^{-1} (Sowing), Soil applied Zn at 7.5 kg ha^{-1} (Sowing)+Foliar applied Zn at 0.1% (30 and 60 DAS), Soil applied Zn at 7.5 kg ha^{-1} (Sowing), Foliar applied Zn at 0.2% (30 and 60 DAS) and Foliar applied Zn at 0.1% (30 and 60 DAS), respectively. However, the minimum (10.6) branches plant^{-1} were noticed in Control treatment where Zn was not applied. The results indicated that statistically, the differences amongst Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS), Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.1% (30 and 60 DAS and Soil applied Zn at 7.5 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS) were non-significant ($P>0.05$).

Pods Plant^{-1}

The pods plant^{-1} has linear impact on the seed yield plant^{-1} under normal soil, climatic and management conditions. The results in relation to pods plant^{-1} of rocket seed as affected by soil and foliar application methods of Zn are presented in Table 3. The results demonstrated that various Zn application doses exhibited significant ($P<0.05$) effect on the pods plant^{-1} of rocket seed. It is obvious from the data that highest pods plant^{-1} (587.3) were noted in plots receiving Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS), closely followed by plots fertilized with Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.1% (30 and 60 DAS and Soil applied Zn at 7.5 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS) resulting in pods plant^{-1} of 580.0 and 579.0, respectively. The pods plant^{-1} exhibited a reducing trend with 458.7, 399.0, 384.3, 358.7 and 341.7 when the rocket seed crop was fertilized with Soil

applied Zn at15 kg ha^{-1} (Sowing), Soil applied Zn at 7.5 kg ha^{-1} (Sowing)+Foliar applied Zn at 0.1% (30 and 60 DAS), Soil applied Zn at 7.5 kg ha^{-1} (Sowing), Foliar applied Zn at 0.2% (30 and 60 DAS) and Foliar applied Zn at 0.1% (30 and 60 DAS), respectively. However, the minimum pods plant^{-1} (322.3) were noticed in No Zn (Control) treatment. The results showed that statistically, the differences amongst Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS), Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.1% (30 and 60 DAS and Soil applied Zn at 7.5 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS) were non-significant (P>0.05).

Table 2. Effect of soil and foliar applied Zn on branches plant^{-1} of rocket seed

Treatments	Mean
No Zn (Control)	**10.6 C**
Soil applied Zn at 7.5 kg ha^{-1} (Sowing)	**11.9 ABC**
Soil applied Zn at 15 kg ha^{-1} (Sowing)	**12.2 ABC**
Foliar applied Zn at 0.1%	**11.5 BC**
Foliar applied Zn at 0.2%	**11.7 ABC**
Soil applied Zn at 7.5 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.1%	**12.3 ABC**
Soil applied Zn at 7.5 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2%	**15.0 AB**
Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.1%	**15.1 AB**
Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2%	**15.7 A**

Table 3. Effect of soil and foliar applied Zn on pods plant^{-1} of rocket seed

Treatments	Mean
No Zn (Control)	**322.3 C**
Soil applied Zn at 7.5 kg ha^{-1} (Sowing)	**384.3 BC**
Soil applied Zn at 15 kg ha^{-1} (Sowing)	**399.0 BC**
Foliar applied Zn at 0.1%	**341.7 C**
Foliar applied Zn at 0.2%	**358.7 C**
Soil applied Zn at 7.5 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.1%	**458.7 B**
Soil applied Zn at 7.5 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2%	**579.0 A**
Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.1%	**580.0 A**
Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2%	**587.3 A**

Plant height (cm)

The data pertaining to plant height of rocket seed as affected by soil and foliar application methods of Zn is presented in table 4.

The data illustrated that various Zn application methods caused significant (P<0.05) effect on the plant height. The results illustrated that maximum plant height 95.3 cm was recorded in plots fertilized with Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS), closely followed by plots fertilized with Soil applied Zn at 15 kg ha^{-1}

(Sowing) + Foliar applied Zn at 0.1% (30 and 60 DAS and Soil applied Zn at 7.5 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS) resulting in plant height of 95.0 and 94.7 cm, respectively. The plant height showed a declining trend with 90.3, 88.7, 87.7, 86.0 and 85.7 cm when the rocket seed crop was fertilized with Soil applied Zn at15 kg ha^{-1} (Sowing), Soil applied Zn at 7.5 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.1% (30 and 60 DAS), Soil applied Zn at 7.5 kg ha^{-1} (Sowing), Foliar applied Zn at 0.2% (30 and 60 DAS) and Foliar applied Zn at 0.1% (30 and 60 DAS), respectively. However, the minimum plant height 81.0 cm was noticed in control. The results indicated that statistically, the differences amongst Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS), Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.1% (30 and 60 DAS and Soil applied Zn at 7.5 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS) were non-significant ($P>0.05$) for plant height.

Table 4. Effect of soil and foliar applied Zn on plant height (cm) of rocket seed

Treatments	Mean
No Zn (Control)	**81.0 D**
Soil applied Zn at 7.5 kg ha^{-1} (Sowing)	**87.7 C**
Soil applied Zn at 15 kg ha^{-1} (Sowing)	**88.7 C**
Foliar applied Zn 0.1%	**85.7 CD**
Foliar applied Zn 0.2%	**86.0 C**
Soil applied Znc 7.5 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.1%	**90.3 BC**
Soil applied Zn 7.5 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2%	**94.7 AB**
Soil applied Zn 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.1%	**95.0 AB**
Soil applied Zn 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2%	**95.3 A**

Seed yield (kg ha^{-1})

A significant increase in the seed yield of rocket seed was observed with an increase dose of soil + foliar Zn fertilizers application as shown in Table 5. It is obvious from the data that maximum seed yield 2300.0 kg ha^{-1} was noted in plots receiving soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS), closely followed by plots fertilized with soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.1% (30 and 60 DAS and soil applied Zn at 7.5 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS) resulting in seed yield of 2290.0 and 2266.7 kg ha^{-1}, respectively. The seed yield showed a diminishing trend with 2134.3, 2090.0, 2060.0, 1970.0 and 1906.7 kg ha^{-1} when the rocket seed crop was fertilized with soil applied Zn at15 kg ha^{-1} (Sowing), soil applied Zn at 7.5 kg ha^{-1} (Sowing)+Foliar applied Zn at 0.1% (30 and 60 DAS), Soil applied Zn at 7.5 kg ha^{-1} (Sowing), Foliar applied Zn at 0.2% (30 and 60 DAS) and Foliar applied Zn at 0.1% (30 and 60 DAS), respectively. Whereas, the minimum seed yield 1883.3 kg ha^{-1} was recorded in control treatment. The results showed that statistically, the differences among Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS), Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.1% (30 and 60 DAS and Soil applied Zn at 7.5 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS) were non-significant ($P>0.05$) for seed yield.

Table 5. Effect of soil and foliar applied Zn seed yield (kg ha^{-1}) of rocket seed

Treatments	Mean
No Zn (Control)	**1883.3 C**
Soil applied Zn at 7.5 kg ha^{-1} (Sowing)	**2060.0 B**
Soil applied Zn at 15 kg ha^{-1} (Sowing)	**2090.0 B**
Foliar applied Zn at 0.1%	**1906.7 C**
Foliar applied Zn at 0.2%	**1970.0 C**
Soil applied Zn at 7.5 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.1%	**2134.3 B**
Soil applied Zn at 7.5 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2%	**2266.7 A**
Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.1%	**2290.0 A**
Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2%	**2300.0 A**

Discussion

The present study has proved that the soil + foliar application of Zn fertilizer have positive effects on the growth and yield of the rocket seed. Foliar application of Zn has proved to be one of the most important inputs to improve the crop foliage and development of healthy seed **[9]**. The past researches observed that foliar fertilization of Zn is useful to fulfil the plant Zn requirement and foliar Zn application immediately delivers the nutrient to the plant tissues and organs. By foliar application of Zn to leaves, the nutrients are absorbed right at the site **[10]**.

In our study, it can be observed that different doses of Zn application and methods have been used for the improvement in the growth and yield of rocket seed (*Eruca sativa*) along with the recommended dose of NPK fertilizer. The results indicated that best performance was achieved with application of soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS), where maximum plant population (41.5 m^{-2}), branches plant^{-1} (15.7), pods plant^{-1} (587.3), plant height (95.3 cm), and seed yield (2300.0 kg ha^{-1}) of rocket seed was recorded, closely followed by plots fertilized with Soil applied Zn at 15 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.1% (30 and 60 DAS) and Soil applied Zn at 7.5 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS) in all growth and yield parameters, particularly seed yield (2290.0 and 2266.7 kg ha^{-1}), respectively. The results of the present study are in the line with the results of **[15],** they revealed that rocket plants were efficient to the foliar application of nutrients as compared to the control plants where no spray of nutrients was applied. Similar results have been obtained by Mahmood and Taha **[2]** who have observed that when Fe Zn with organic manure was applied to Eruca sativa, it significantly increased plant height, crop yield, plant fresh and dry weight of Eruca sativa.

The statistical analysis of data illustrated that although Zn applied at higher rates either through soil or foliar resulted in higher numerical values, but integration of Soil applied Zn at 7.5 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS) was recorded the highest economical for obtaining maximum yield of rocket seed because it showed non-significant (P>0.05) results with higher rate treatments. The combination of foliar application with soil application increased branches plant^{-1}, pods plant^{-1}, plant height (cm) and seed yield (kg ha^{-1}) significantly over control, while the results were non-significant for plant population. These results are in accordance with **[13]** who reported that Zn application at higher rates significantly increased seed yield ha^{-1}. Similarly, Mandal and Sinha **[14]** reported significant improvement in growth

and yield parameters of oilseed mustard due to higher $ZnSO_4$ application over control. Likewise, Sharma and Chaudhry **[10]** observed that foliar application of Zn is beneficial for plant requirements because it delivers the nutrients quickly to the plant tissues and organs.

Conclusion

It has been concluded from the present study that both soil and foliar application methods of Zn significantly affected growth and yield of rocket seed. Soil applied Zn at 7.5 kg ha^{-1} (Sowing) + Foliar applied Zn at 0.2% (30 and 60 DAS) was found most economical and suitable for obtaining optimum yield of rocket seed because it showed non-significant differences with higher rate treatments. Further studies are needed for better growth and yield of rocket seed in future.

Authors' contributions

Conceived and designed the experiments: N Ahmed & B Ali, Performed the experiments: N Ahmed, S Ahmed & AZ Jamali, Analyzed the data: ZU Haq & AA Kaleri, Wrote the paper: M Kumar & AA Kaleri.

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