

EFFECT OF FOLIAR APPLICATION OF UREA AND PLANOFIX ON THE FOLIAGE YIELD OF CORIANDER

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Abstract

An experiment on coriander (*Coriandrum sativum* L.) was conducted at the experimental field of Department of Horticulture, Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Gazipur during November 2012 to April 2013 to find out the suitable foliar doses and application frequency of urea and planofix (NAA). The experiment was laid out in factorial randomized complete block design with three replications. The treatment consisted of six foliar doses viz. T₁ (Tap water as control), T₂ (0.10 % urea), T₃ (0.25 % urea), T₄ (0.40 % urea), T₅ (5 ppm planofix) and T₆ (10 ppm planofix) and three application frequencies viz. F₁ [20 days after sowing (20 DAS)], F₂ (30 DAS) and F₃ (20 and 30 DAS). Maximum foliage yield (6.94 t/ha) was recorded in 10 ppm planofix coupled with its twice application at 20 and 30 DAS which was closely followed the foliage yield (6.33 t/ha) by 5 ppm planofix with the same application frequency. The foliage yield was increased with the increase in urea concentration. The highest foliage yield (5.37 t/ha) was also recorded from twice application of urea and planofix at 20 and 30 DAS, respectively. Planofix 10 ppm with its twice application at 20 and 30 DAS gave the highest benefit-cost of ration 2.51.

Keywords: Coriander, Urea, Planofix, Foliage Yield

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Note: The authorship is changed on 23.02.2016 from Abdur Rakib¹, M. Kamruzzaman^{1*}, Soyema Khatun¹ and M. Moniruzzaman² to Abdur Rakib¹, M. Moniruzzaman², M. Hasan³ and M.M. Rahman³. The authorship is changed due to request of the principal author to add two co-authors of his major professor and advisory committee member of postgraduate study and two co-authors are excluded from the authorship and acknowledged them for their contribution in the manuscript.

Introduction

Coriander (*Coriandrum sativum* L.) is an important spice crop known as 'Dhania' in Bangla. It is native to Southern Europe and the Mediterranean region and is extensively grown throughout the world. It has been cultivated since human antiquity (Tiwari and Agrawal, 2004). Precisely Italy is presumed as the native place of coriander (Thumberaj and Singh, 2004). Coriander grows under a wide range of conditions in temperate regions but normally cultivated in winter in Bangladesh (Ahmed and Haque, 1985). Practically all parts of the plant are used as spice, which have pleasant aromatic odor. Coriander leaves and seeds are valued as food mainly for its high carotene content. Its leaves are one of the rich sources of vitamin C (250 mg/100 g) and vitamin A (10,460 I.U./100g). Its seeds also contain considerable amount of vitamin C (12 mg/100) and vitamin A (175 I.U. /100 g) (Pruthi, 1998). The fresh leaves are an ingredient in many foods such as chutneys and salads. The dried fruits also have a fragrant odor and pleasant aromatic taste. The dried ground fruits are the major ingredients of the curry powder. The odor and taste are due to the essential oil content, which varies from 0.1 to 1.0 percent in the dry seeds (Kumar *et al.*, 1994). It has medicinal purpose too. Chemicals derived from coriander leaves were found to have antibacterial activity against *Salmonella choleraesuis*, and this activity

was found to be caused in part by these chemicals acting as nonionic surfactants. Coriander has been documented as a traditional treatment for type 2 diabetes. A study on mice found coriander extract had both insulin-releasing and insulin-like activity (<http://en.wikipedia.org/wiki/Coriander>). For successful production, all necessary nutrients must be supplied to the plants judiciously in a sufficient amount. Among different major plant nutrients, nitrogen is required in large amounts (Brady, 1990) and this macronutrient makes the plant leaves succulent and soft. It is a short duration crop and is generally harvested within 30 to 50 days after sowing (Babik, 1999). The efficiency of nitrogenous fertilizer depends to a great extent, on the time and method of application, because nitrogenous fertilizers which are highly water soluble and easily lost from soil in various ways. The nitrogen loss may be averted over by using different application methods mainly through foliar application. Planofix is a substance containing naphthalene acetic acid (NAA). It increases cell elongation, there by increases the leaf area of the plants and ultimately increases the foliage yield of coriander. Information is scanty on the use of urea and planofix as foliar application for coriander foliage production in Bangladesh. Keeping the above facts in view the present experiment has been undertaken to

determine the suitable foliar doses of urea and planofix for higher coriander foliage yield, to find out the suitable application frequency of urea and planofix for higher coriander foliage yield and to determine the profitable foliar doses and application frequency of urea and planofix for coriander cultivation.

Materials and Methods

The experiment was conducted at the Horticulture Research Farm of Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur during the period from November 2012 to April 2013 to study the effect of urea and planofix on coriander foliage yield. The field experiment having two factors was laid out in Randomized Complete Block Design (RCBD) with three replications. The treatment consisted of six foliar doses *viz.* T₁ (Tap water as control), T₂ (0.10 % urea), T₃ (0.25 % urea), T₄ (0.40 % urea), T₅ (5 ppm planofix) and T₆ (10 ppm planofix) and three application frequencies *viz.* F₁ [20 days after sowing (20 DAS)], F₂ (30 DAS) and F₃ (20 and 30 DAS). Replication to replication and plot to plot distance were 1.0 m and 0.5 m, respectively. The size of each unit plot was 3 m x 1 m (3 m²). The total area of the experiment was 332 m². Total number of plots was 54. The planofix is a product of Bayer Crop Science containing NAA use as foliar spray. The variety Rosina of Pahuja seed company, India was used as plant material. The seeds (fruits) were rubbed for separating two mericarps (seeds) and were soaked in water for 24 hours to enhance germination. Seed were also treated with Bavistin @ 2 g per kg of seeds before sowing. The seeds were sown in rows 10 cm apart continuously by hand @ 40 kg/ha (Moniruzzaman, 2011). To allow uniform sowing in rows seeds were mixed with some loose soil and watering after sowing just to supply sufficient moisture needed for quick germination. The field was kept weed free initially by hand weeding.

Weeding was done after 25 days after sowing (DAS). Data were recorded on the plant spread, plant height, longest leaf length, leaves per plant, plant weight, green plants/m², green plant weight/m², foliage yield (t/ha). All the data were compiled and analyzed statistically by MSTAT--C program. The mean comparison was done at 5% level of probability following the Duncan's Multiple Range Test (DMRT).

Results and Discussion

Foliar spray and application frequency of urea and planofix on plant growth

There was a significant interaction of foliar and application frequency of urea and planofix on plant spread, plant height, longest leaf length, leaves/plant, and plant weight, number of plants/m² and plant weight/m² at 40 DAS (Table 1). The maximum plant spread (23.62 cm) was observed in combination of T₆F₃ which was closely followed by T₆F₂ (23.59 cm) and T₄F₃ (23.25 cm) and minimum was found in T₁F₂ (17.74 cm) which was statistically similar to T₁F₁ (17.84 cm), T₁F₃ (18.20 cm), T₂F₁ (19.12 cm) and T₂F₂ (18.88 cm) (Table 1). The highest plant height was observed in T₆F₃ (16.48 cm) which was at par with T₄F₃ (16.13 cm) and the lowest plant height was found in T₁F₃ and T₁F₂ (12.99 cm) which were statistically similar to T₁F₁ (13.11 cm) (Table 1). The result of plant height influenced by T₄ (0.40% urea) is in agreement with the report of Sharangi *et al.* (2012). This observation also supported by the observation of Shanu *et al.* (2013). The maximum leaf length was recorded in T₆F₃ (15.34 cm) which was statistically similar to T₄F₃ (14.90 cm), T₅F₃ (14.67 cm), T₆F₂ (14.18 cm), T₄F₂ (14.05 cm) and T₄F₁ (13.95 cm) where the lowest leaf length (11.52 cm) was found in T₁F₁ (Table 1).

Table 1. Interaction effect of foliar spray and application frequency of urea and planofix on plant spread, plant height, leaf length, leaves /plant, plant weight, green plants/ m² and plant weight /m² of coriander at 40 days after sowing

Treatment combination	Plant spread	Plant height	Leaf length	Leaves /plant	Plant weight (g)	Green plants /m ²	Plant weight /m ² (Kg)
T ₁ F ₁	17.82g	13.11 i	11.52 g	8.77 gh	1.43 j	433.3	0.62 j
T ₁ F ₂	17.74g	12.99 i	12.21 efg	8.57 h	1.65 j	433.7	0.71 ij
T ₁ F ₃	18.20g	12.99 i	12.65 d-g	8.97 efg	2.27 hi	436.0	0.81 hi
T ₂ F ₁	19.12fg	14.08 h	12.30 efg	8.83 fgh	2.31 ghi	435.0	0.84 hi
T ₂ F ₂	18.88g	13.97 h	11.86 fg	8.97 efg	2.08 i	434.7	0.76 hi
T ₂ F ₃	20.65ef	14.34 gh	13.13 c-f	9.27 b-e	2.55 efg	434.3	0.88 gh
T ₃ F ₁	20.66ef	14.75 ef	12.13 fg	9.23 cde	2.32 ghi	435.7	0.85 hi
T ₃ F ₂	20.77def	14.63 fg	12.82 d-g	9.20 c-f	2.46 fgh	436.0	0.99 fg
T ₃ F ₃	21.28de	15.04 de	13.95 a-d	9.10 d-g	3.28 cd	431.3	1.05 ef
T ₄ F ₁	22.20b-e	15.35 cd	13.95 a-d	9.30 b-e	2.69 ef	434.0	1.08 ef
T ₄ F ₂	21.45cde	15.33 cd	14.05 a-d	9.57 bc	3.18 d	432.3	1.09 ef
T ₄ F ₃	23.25abc	16.13 ab	14.90 ab	9.57 bc	3.69 b	433.7	1.13 def
T ₅ F ₁	21.60cde	15.14 de	13.30 c-f	9.30 b-e	2.79 e	434.0	1.16 def
T ₅ F ₂	21.48cde	15.16 de	13.28 c-f	9.10 d-g	3.48 bc	433.7	1.16 cde
T ₅ F ₃	22.41be	15.74 bc	14.67 abc	9.63 b	3.95 a	432.3	1.29 abc
T ₆ F ₁	22.51bcd	15.74 bc	13.73 b-e	9.30 b-e	3.63 b	436.0	1.26 bcd
T ₆ F ₂	23.59ab	15.85 b	14.18 a-d	9.47 bcd	3.67 b	435.0	1.34 ab
T ₆ F ₃	23.62a	16.48 a	15.34 a	10.20 a	4.05 a	435.3	1.42 a
Level of significance	*	*	*	*	*	NS	*
CV (%)	4.56	1.61	6.22	2.16	3.98	5.64	7.61

Means having different letters are not significantly different at 5% level of probability by DMRT

This result is in partial agreement with Vedamuthu *et al.* (1996) who got higher values of growth parameter with 40 ppm NAA and partially supported by the observation of Shanu *et al.* (2013) who reported leaf length was increased with the increase of application frequency. The maximum leaves per plant were found in T₆F₃ (10.20) which were followed by T₅F₃ (9.63) (Table 1). The minimum leaf number was recorded in T₁F₂ (8.57). The result corroborate with the report of Piyush and Sen (2002) who reported that NAA 50 ppm gave the highest number of green leaves of coriander per plant (22.03/plant) in multicastr system. The maximum plant weight was found in T₆F₃ (4.05 g) which was statistically similar to T₅F₃ (3.95 g) but minimum weight was recorded in T₁F₁ (1.43 g) which was at par with T₁F₂ (1.65 g) (Table 1). The green plants per square meter were found insignificant for foliar spray and application frequency of urea and planofix and their interaction. Interaction of foliar spray and application frequency had significant effect on green plant yield/m². The maximum foliage weight was recorded in T₆F₃ (1.42 kg/m²) which was statistically similar to T₆F₂ (1.34 kg/m²) and T₅F₃ (1.29 kg/m²) and the lowest (0.62 kg/m²) was observed in T₁F₁ which was statistically similar to T₁F₂ (0.71 kg/m²) (Table 1).

Foliage yield (t/ha)

The foliage yield was significantly influenced by different foliar spray of urea and planofix. The maximum foliage yield was recorded in T₆ (6.53 t/ha) which was significantly higher than the other treatments and followed by T₅ (5.87 t/ha) T₄ (5.40 t/ha), T₃ (4.74 t/ha) and T₂ (4.05 t/ha) and the minimum yield from control T₁ (3.50 t/ha) (Fig. 1). Planofix 10 ppm (T₆) gave the highest foliage yield of coriander because all the growth parameters viz. plant spread, plant height, leaves/plant, plant weight and green plant yield per square meter were maximum at that treatment. This is in consonance with the result of Badgujar and Warhal (1999). Foliage yield had also strong positive correlation with all growth parameters. Among the nitrogen doses 0.40% urea (T₄ treatment) gave the maximum yield (540 t/ha) compared to other nitrogen doses. This

correlations the result of Badgujar *et al.* (1977) who reported that foliar application of 0.25% urea 20 days after sowing gave the maximum foliage leaf yield of 8.38 t/ha in coriander while control treatment gave only 3.38 t/ha. It might be nitrogen is an integral component of many compounds, including chlorophyll and enzymes, essential for plant growth processes. It is an essential component of amino acids and related proteins, which are critical not only building block for plant tissue but also in the cell nuclei and protoplasm. Nitrogen is essential for carbohydrate use within plants and stimulates root growth and development as well as the uptake of other nutrients. This element encourages above ground vegetative parts and gives a deep green color to the leaves (Brady, 1990).

The foliage yield was significantly influenced by different application frequencies. The maximum foliage yield was recorded in F₃ (5.37 t/ha) followed by F₂ (4.97 t/ha) and minimum foliage yield was observed in F₁ (4.71 t/ha) (Fig. 2). The urea and planofix spray twice at 20 and 30 DAS (F₃) gave maximum values in respect of all growth parameters viz. plant spread, plant height, leaves/plant, plant weight and green plant weight per square meter. This observation partially supported by the observation of Shanu *et al.* (2013) who reported vegetative yield was increased with the increase of application frequency of foliar spray.

Interaction effect of foliar spray and application frequency had significant effect on foliage yield. The maximum foliage yield was recorded in T₆F₃ (6.95 ton/ha) which was statistically similar to T₅F₃ (6.33 ton/ha) and the lowest foliage yield was obtained from T₁F₁ (3.04 ton/ha) which was statistically similar to T₁F₂ (3.51 t/ha) (Fig. 3). It is evident that planofix 10 ppm or 5 ppm when interacted with twice application of planofix at 20 and 30 DAS gave the maximum foliage yield. The solution of urea 0.40% when interacted with its twice application at 20 and 30 DAS (F₃) produced reasonable yield of foliage (5.54 t/ha) that was higher than control other interaction of urea and F₃.

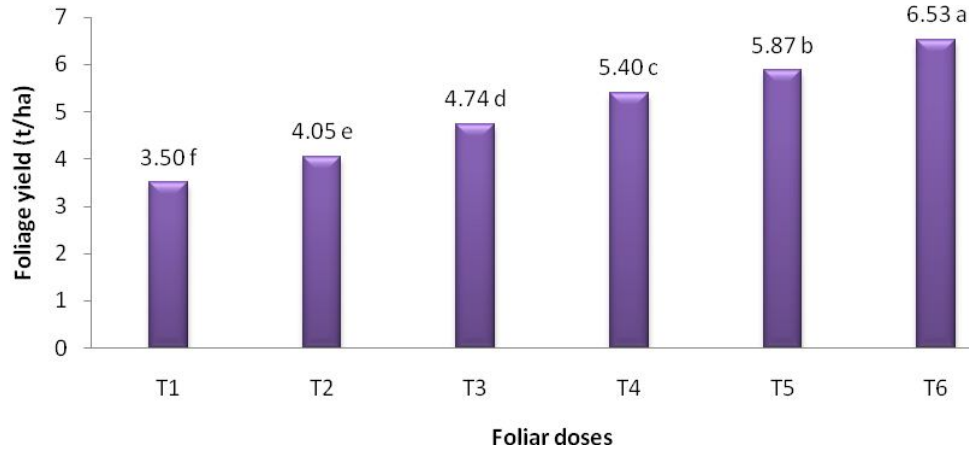


Fig. 1. Foliage yield influenced by foliar spray of urea and planofix of coriander. Figures placed on top of the bar with different letters are significantly different at 5% level of probability by DMRT.

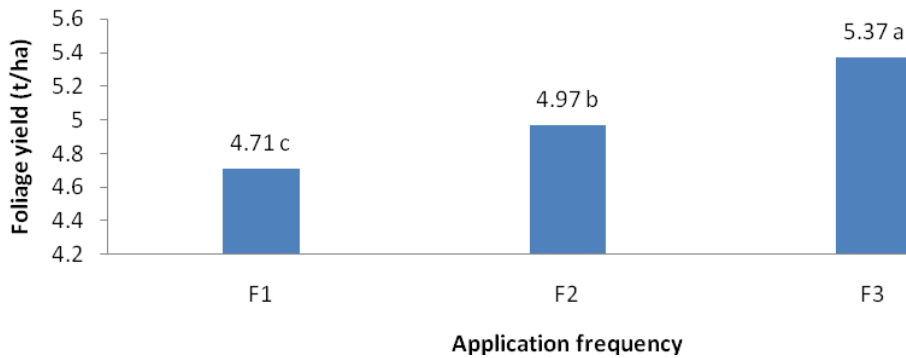


Fig. 2. Foliage yield influenced by application frequency of urea and planofix of coriander. Figures placed on top of the bar with different letters are significantly different at 5% level of probability by DMRT.

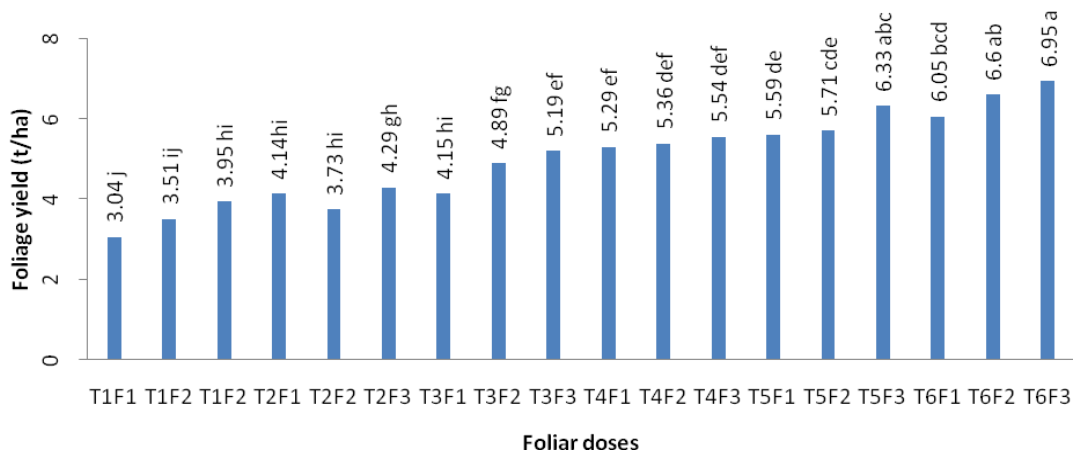


Fig. 3. Foliage yield influenced by interaction of foliar spray and application frequency of urea and planofix of coriander. Figures placed on top of the bar with different letters are significantly different at 5% level of probability by DMRT.

Conclusion

The growth parameters *viz.* plant spread, plant height, leaf length, leaves/plant, plant weight, plant weight/m² and foliage yield were found maximum from the foliage spray of 10 ppm planofix as well as its twice application at 20 and 30 days after sowing. Planofix 5 ppm in combination with its twice spray at 20 and 30 DAS produced the second highest foliage yield of coriander. The solution of urea 0.40% coupled with twice spray at 20 and 30 DAS produced reasonable foliage yield of coriander. Thus, 10 ppm planofix with its twice application may be used for maximum production of foliage yield of coriander.

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