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Effect of foliar spray of urea and NAA on the rhizome rot disease of ginger (*Zingiber officinale* Roscoe)

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Abstract
A field study was conducted at Department of Horticulture Kulbhaskar Ashram P.G. College, Allahabad during 2016 and 2017 to study the Effect of foliar spray of urea and NAA on Rhizome rot of Ginger. Healthy and disease free ginger rhizomes were selected and used for planting. The rhizomes were then cut into small pieces of about 15 gm. weights and planted at spacing of 25x20 cm. The experimental was conducted in Factorial Randomized Block Design. Results showed that the incidence of rhizome rot disease during the crop period indicated that main effect of urea and NAA and their interaction differed significantly in both years. It could be inferred from the mean table of urea and NAA that the application of Urea 2.0% decreased the infection of total rhizome rot in both the years. In case of NAA the maximum infection percent (13.21 and 13.37) was found in N_2 (NAA 400 ppm) followed by N_1 (NAA 200 ppm) 11.12 and 11.32 percent which was at par with No (NAA 0 ppm) 10.55 and 10.68 percent in first and second year respectively. The minimum infection of total rhizome rot was found in V_1 x N_1 which was at par with U_1 x V_o followed by the treatment combination V_1 N_2 whereas the maximum infection was found in U_oN_1, which was at par with U_oN_2 in both the year.

Keywords: Ginger, rhizome rot, Urea, NAA, foliar spray

Introduction
India is considered as a 'magical land of spices' with diverse variety of spices. Ginger (*Zingiber officinale* Roscoe) is earliest known oriental spices, belonging to the family, Zingiberaceae. Though entire plant is refreshingly aromatic, the underground rhizomes of this crop are valued as spice. It is one of the commonly consumed dietary condiments in the world and has high medicinal properties. Ginger is being cultivated in the various parts of the world. The total production of ginger in the world is 1683 thousand tons with the total acreage of 310.43 thousand ha (Gupta and Tennyson 2019) [3]. China, India, Nepal and Thailand are the major producers of ginger in the world. India is the leading producer and exporter of ginger in the world. Annually, India produces 385.33 thousand tons of ginger. it is also used in the preparation of ginger wine, ginger beer, ginger carbonated water etc. pickled in salt is largely used in Indian homes. In addition, it is used in the preparation of tincture ginger, gongoal gingerine, digestive tablets, honey ginger, powder ginger and dry ginger. It is also used for the extraction of essential oil gingerol. Ginger is attacked by various diseases, such as rhizome rot, bacterial wilt, leaf spot, anthracnose leaf spot, leaf blight, leaf blotch etc. Among all of the diseases, rhizome rot is most damaging one (Chattopadhya, 1997) [1]. Rhizome rot of ginger caused by *Pythium aphanidermatum* is a very common and widespread disease in ginger. The disease causes serious constraint for ginger production in ginger growing areas. The disease is very important because it causes economic losses to growers resulting in increased prices of products to consumers. The infected rhizome become rotten and is completely destroyed. The crop is affected in conducible soil for recurrent cultivation. The country depends on import of ginger and hence the trend of price is being increased always. There is no proper method available to control rhizome rot in ginger growing areas. As the pathogen perpetuates in soil, so it is very difficult job to control (Chowdhury *et al*., 2009) [2]. The use of growth substances like IAA, IBA, NAA for improving the growth and development as well as yield have been reported in different crops of vegetables, but no such work has been done in case of ginger. Under the above background a field trial was undertaken to assess the performance of improved varieties like Rio-de-Jeneirro and Baruwa Sagar with single and mixed application of Urea and NAA on the rhizome rot.

Materials and Methods

The experiment was laid out in the Department of Horticulture at Kulbhaskar Ashram Post Graduate College, Allahabad during 2016 and 2017 to study the Effect of foliar spray of urea and NAA on Rhizome rot of Ginger. The experiment was conducted in Factorial Randomized Block Design in three replications involving twelve treatments comprising two levels of urea (U_0 -0% & U_1-2%), three levels of NAA (N_0 – 0ppm, N_1-200ppm & N_2 -400ppm) and two varieties (V_1-Barua sagar andV_2- Rio-de-Jeneiro).The district of Allahabad lies between 40º75'-25º-85'N north latitude and 81º-20' - 82º-55' East longitude in Uttar Pradesh and situated at about 97.0 meters above the sea level. It forms a representative part of the Upper Gangetic plain. It comes under the climatic type C_1 i.e., "Dry Sub-humid climate" showing an extreme low and high temperature during winter and summer months, respectively. The rain usually starts in the latter half of June and remains during the month of July to September after a long spell of summers. The mean monthly values of weather conditions for the period of investigations recorded at the meteorological observatory Bamrauli Aerodrome, Allahabad. The surface soil upto 22.5 cm. depth of the experimental plot was sampled from five places selected at randomly before planting of rhizome to form a composite sample. Such samples collected for both the years were chemically analyzed. The soil was sandy loam in texture and was quite favorable for plant growth. The soil reaction was almost neutral having fairly uniform fertility status in both the years.

Result and Discussion

The rhizome rot infection at early stage did not show significant differences due to effect of variety, urea and NAA in the first year. But, in the second year the effect of NAA and interaction of urea with NAA and variety with NAA were significantly different. The minimum infection was found in NAA 200 ppm. In case of urea and NAA combination, a minimum was in U_oN_o, while in case of variety and NAA, V_2N_1 (Rio-de-Jeneiro with NAA 200 ppm) recorded minimum infection. The rhizome rot at final stage indicated the variety Rio-de-Jeneiro was susceptible to rhizome rot. It was also found that the infection of rhizome rot was minimum in urea 2 per cent and maximum infection in NAA 400 ppm. The minimum infection was found in combination of urea 2 per cent with NAA 0 ppm and urea 2 per cent with NAA 200 ppm. In terms of total rhizome rot infection, the application of urea 2 per cent decreased the infection in both the years. The minimum infection was found in NAA 0 ppm. In respect of interaction, the minimum infection was found in urea 2 per cent with NAA 200 ppm. A wide assortment of plant growth promoting products are being marketed with claims made for beneficial effects on crop growth and yields. Typically, these products are supposed to) increase disease resistance (Harms and Oplinger; 2014) [4]

Table 1: Mean Rhizome rot infection at early stage (Per cent) V x U

Treatments	U_o	U_1	Mean	U_o	U_1	Mean
V_1	6.533 (14.72)	6.683 (14.95)	6.608 (14.84)	6.417 (14.61)	6.750 (15.03)	6.583) 14.82)
V_2	6.600 (14.75)	6.816 (15.11)	6.708 (14.93)	6.650 (14.90)	6.783 (15.07)	6.716 (14.98)
Mean	6.566 (14.73)	6.749 (15.03)	6.658 (14.89)	6.533 (14.75)	6.766 (15.05)	6.649 (14.90)

V x N

Treatment	N_o	N_1	N_2	Mean	N_o	N_1	N_2	Mean
V_1	6.523 (14.75)	6.050 (14.01)	7.250 (15.51)	6.608 (14.84)	6.500 (14.71)	6.000 (14.16)	7.250 (15.59)	6.583 (14.82)
V_2	6.650 (14.77)	6.200 (14.41)	7.275 (15.62)	6.708 (14.93)	6.650 (14.90)	6.125 (14.32)	7.375 (15.73)	6.716 (14.98)
Mean	6.590 (14.76)	6.125 (14.31)	7.262 (15.59)	6.590 (14.89)	6.575 (14.81)	6.062 (14.24)	7.312 (15.66)	6.647 (14.90)

N x U

Treatments	U_o	U_1	Mean	U_o	U_1	Mean
N_o	5.850 (13.82)	7.330 (15.69)	5.590 (14.76)	5.600 (13.68)	7.550 (15.94)	6.575 (14.81)
N_1	6.00 (14.14)	6.250 (14.47)	6.125 (14.31)	6.000 (14.16)	6.125 (14.32)	6.062 (14.24)
N_2	7.850 (16.24)	6.680 (14.93)	7.262 (15.59)	8.000 (16.42)	6.625 (14.90)	7.312 (15.66)
Mean	6.566 (14.73)	6.749 (15.03)	6.658 (14.89)	6.533 (14.75)	6.766 (15.05)	6.649 (14.90)

Standard Error and Critical difference

Comparison between means of	S.E(M) +	C.D. at 5%	S.E(M) +	C.D. at 5%
V	0.2658	-	0.1737	-
U	0.2658	-	0.1737	-
N	0.3256	-	0.2127	0.6239
VU	0.3760	-	0.2456	-
Vn	0.4606	1.3510	0.3008	0.8823
UN	0.4606	1.3510	0.3008	0.8823
VUN	0.6513	-	0.4254	-

Table 2: Mean Rhizome rot infection at early final stage (Per cent) V x U

Treatments	U_o	U_1	Mean	U_o	U_1	Mean
V_1	11.66 (19.91)	4.46 (10.57)	8.06 (15.24)	11.05 (19.33)	4.58 (11.65)	7.81 (15.49)
V_2	12.48 (20.27)	5.08 (12.30)	8.78 (16.47)	11.96 (20.19)	5.16 (12.25)	8.56 (16.22)
Mean	12.07 (20.27)	4.77 (11.43)	8.42 (15.85)	11.50 (19.76)	4.87 (11.95)	8.19 (15.86)

V x N

Treatment	N_o	N_1	N_2	Mean	N_o	N_1	N_2	Mean
V_1	6.15 (13.00)	8.35 (15.58)	9.70 (17.13)	8.06 (15.24)	5.85 (12.96)	8.47 (15.94)	9.12 (17.57)	7.81 (15.49)
V_2	6.62 (13.84)	9.12 (16.57)	10.600 (18.99)	8.78 (16.47)	6.17 (13.34)	8.52 (15.96)	11.00 (19.36)	8.56 (16.22)
Mean	6.38 (13.42)	8.73 (16.08)	10.15 (18.06)	8.42 (15.85)	6.01 (13.15)	8.50 (15.95)	10.06 (18.46)	8.19 (15.86)

N x U

Treatments	U_o	U_1	Mean	U_o	U_1	Mean
N_o	11.02 (19.38)	1.75 (7.46)	6.38 (13.42)	10.15 (18.55)	1.87 (7.75)	6.01 (13.15)
N_1	14.60 (22.46)	2.87 (9.70)	8.73 (16.08)	14.00 (21.96)	3.00 (9.94)	8.50 (15.95)
N_2	10.60 (18.99)	9.70 (17.13)	10.15 (18.06)	10.37 (18.76)	9.75 (18.17)	10.06 (18.46)
Mean	12.07 (20.27)	4.77 (11.43)	8.42 (15.85)	11.50 (19.76)	4.87 (11.95)	8.19 (15.86)

Standard Error and Critical difference

Comparison between means of	S.E(M) +	C.D. at 5%	S.E(M) +	C.D. at 5%
V	0.3627	1.0638	0.2327	0.6826
U	0.3627	1.0638	0.2327	0.6827
N	0.4441	1.3027	0.2850	0.8358
VU	0.5129	-	0.3291	-
Vn	0.6283	-	0.4031	-
UN	0.6283	1.8427	0.4031	1.1824
VUN	0.8884	-	0.5700	-

Table 3: Mean total rhizome rot infection (per cent) V x U

Treatments	U_o	U_1	Mean	U_o	U_1	Mean
V_1	13.46 (21.52)	9.31 (17.67)	11.39 (19.59)	13.80 (21.78)	9.63 (17.9)	11.71 (19.88)
V_2	14.08 (22.03)	9.65 (17.99)	11.86 (20.01)	14.05 (21.99)	9.65 (18.01)	11.85 (20.00)
Mean	13.77 (21.77)	9.48 (17.83)	11.62 ()19.80)	13.92 (27.89)	9.64 (18.00)	11.78 (19.94)

V x N

Treatment	N_o	N_1	N_2	Mean	N_o	N_1	N_2	Mean
V_1	10.17 (18.59)	10.92 (19.10)	13.07 (21.18)	11.39 (19.59)	10.60 (18.91)	12.25 (19.36)	13.30 (21.37)	11.71 (19.88)
V_2	10.92 (19.18)	11.32 (19.44)	13.35 (21.41)	11.86 (20.01)	10.77 (19.09)	11.40 (19.49)	13.37 (21.43)	11.85 (20.00)
Mean	10.55 (18.84)	11.12 (19.21)	13.21 (21.30)	11.62 (19.80)	10.68 (19.00)	11.32 (19.45)	13.33 (21.40)	11.78 (11.11)

N x U

Treatments	U_o	U_1	Mean	U_o	U_1	Mean
N_o	12.82 (20.98)	8.27 (16.71)	10.55 (18.84)	12.55 (20.74)	8.82 (17.26)	10.68 (18.80)
N_1	14.45 (22.34)	7.80 (16.20)	11.12 (19.27)	14.87 (22.67)	7.77 (16.18)	11.32 (19.27)
N_2	14.05 (22.01)	12.37 (20.59)	13.21 (21.30)	14.35 (22.25)	12.32 (20.55)	13.37 (21.30)

Mean	13.77 (21.77)	9.48 (17.83)	11.62 (19.80)	13.92 (21.89)	9.64 (18.00)	11.78 (19.80)

Standard Error and Critical difference

Comparison between means of	S.E(M) +	C.D. at 5%	S.E(M) +	C.D. at 5%
V	0.1892	-	0.2124	-
U	0.1892	0.5550	0.2124	0.6230
N	0.2318	0.6799	0.2601	0.7630
VU	0.2676	-	0.3004	-
Vn	0.3279	-	0.3680	-
UN	0.3279	0.9617	0.3680	1.0793
VUN	0.4636	-	0.5203	-

References

1. Chattopadhya SB. Diseases of plants Yielding Drugs, Dyes and Spices, New Delhi: Indian Council of Agric. Res 1997.
2. Chowdhury EK, Hasan MM, Mustarin K, Hasan MS, Fancy R. Efficacy of different fungicides in controlling rhizome rot of ginger. J Agrofor. Environ 2009;3(1):179-181.
3. Gupta Meenu, Tennyson Jebasingh. Diseases of Ginger. Intech Open 2019, 1-31.
4. Harms Charles L, Oplinger Edward S. Plant Growth Regulators: their Use in Crop Production. North Central Ftegion Extension Publication 2014, 303.