www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; SP-10(11): 418-420
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www.thepharmajournal.com
Received: 23-09-2021
Accepted: 26-10-2021

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Effect of foliar spray of urea and NAA on the recovery percentage and production of oleoresin

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Abstract
Ginger alloramin is an important condiment in food and pharmaceutical industries because of its antioxidant and poly phenolic compounds. Therefore present investigations are based on the study of the effect of foliar spray of urea and NAA on the recovery percentage and Production of olioresin.
Study was conducted in the department of Horticulture at Kulbhaskar Ashram P.G. College, Allahabad during 2016-17. Recovery percentage of oleoresin calculated on variety Rio-de-Janeiro (5.76, 5.62 and 5.69 per cent recovery of oleoresin) was more than Barua Sagar (5.43, 5.33 and 5.38 per cent) in the first year as well as second year in pooled analysis. The recovery of oleoresin content was also more in U_1 (Urea 2%) and found 5.83, 5.63 and 5.73 per cent in both the year and pooled mean. In case of NAA application, the maximum Oleoresin content was found in N_2 followed by N_1 and N_o. The values were 6.16, 5.70 and 4.93; 6.03, 5.61 and 4.79 and 6.09, 5.65 and 4.86 percent, respectively in first year and second year and in pooled mean.
The production of oleoresin is the important character to judge the effect of Urea and NAA on the varieties under observation. Production of oleoresin was more in variety Rio-de-Janeiro to the tune of 373.15, 357.14 and 365.25 Kg/ha than in variety Baruwa sagar which contributed 342.67, 326.06 and 334.36 Kg/ha. in first year, second year and pooled mean respectively. The application of Urea also increased the production of oleoresin as 372.72, 350.80 and 361.76 kg/ha in first year, second year and pooled mean, respectively. it was also noticed that the maximum oleoresin content was obtained with the application of N_2 (NAA 400 PPM) followed by N_1 (NAA 200 PPM) and N_o (NAA OPPm) to the extent of 395.79, 379.27 and 387.53, 362.72, 348.78 and 355.75 and 315.22, 297.05 and 306.13 Kg/ha, respectively in first year, second year and pooled mean.

Keywords: Urea, NAA and Ginger

Introduction
Ginger (*Zingiber officinale*, Roscoe) occupies an important spice crop of our country. It belongs to family zinziberaceae. Botanically ginger is the Rhizome or the underground modified stem. It is a herbaceous perennial crop but commercially cultivated as an annual crop. The ginger of commerce is the dry product of the green underground stem or rhizome, which is valued as a spice.
In the spice trade, the dry ginger is the major item. Dry ginger contains 69 percent moisture, 8.6 per cent protein, 6.4 per cent fat, 5.9 per cent fiber, 5.7 per cent ash mineral and vitamin like A, B and C 380 calories/ 100 g. This ginger is valued for its aromatic and pungent principles. The colour and fibre content are also important. The odour of Indian ginger is aromatic, the taste is strongly aromatic and pungent.
It is used in various medicinal culinary preparation. The significance of ginger in the form of preserves and confectionaries can not be ignored. It is also used in the preparation of ginger wine, ginger bear, ginger-carbonated water etc. In addition it is used in the preparation of tincture ginger, digestive tablets, honey ginger, powder ginger and dry ginger. It is also used for the extraction of oleoresin Ginger oleoresin is extracted from various types of ginger but majority of all ginger oleoresin are derived from Nigerian and Jamica ginger, the farmer being the most inexpensive material, the latter having the most refined aromo from. The Southwest Coast of India produces a highly appreciated quality of ginger, which is preferred for the production of oleoresin for use in carbohydrated beverages extractive and their physically modified derivation. It is a product which may contain resin acids and their ester, terpenes and oxidation or polymerization production of these terpenes. (Zingiber officinalis Roscoe).
Rio-de-Janeiro is an important cultiver which was introduced in India as a heavy yielder having more Pungency with less fibre content. The local variety Baruwa Sagar is popular one among the farmers because of its larger area under cultivation.

Under the above background the experiment was under taken to asses the performance of improved varieties like Rio-de-Janeiro and Barua Sagar with single and mixed application of Urea and NAA on the recovery percentage and production of oleoresin.

Materials and Methods

The experiment was conducted in the department of Horticulture at Kulbhaskar Ashram P.G. College, Allahabad during 2016-17 to study the effect of foliar spray of urea of NAA on the recovery percentage and production of Oleoresin. The experiment was conducted in three replication involving twelve treatment, comprising two levels urea (U_o - 0% and U_1 = 2%), three level of NAA - N_o - oPPM, N_1 - 200 PPM and N_2 - 400 PPM and used two varieties V_1 - Baruwa Sagar and V_2 - Rio-de-Janeiro.

The experiment was planned with treatments namely T_1-V_1 U_0 N_0 T_2-V_1 U_0N_1, T_3-V_1 U_0N_2 T_4-V_1 U_1N_0 T_5-V_1 U_1N_1 T_6-V_1 U_1N_2 T_7-V_2 U_0N_0 T_8-V_2 U_0N_1 T_9-V_2 U_0N_2 T_{10}-V_2 U_1 N_0 T_{11}-V_2 U_1N_1 T_{12}-V_2 U_1N_2 in case of urea and NAA application Urea 2 per cent and NAA 400 PPM produced higher recovery percentage of oleoresin than other treatment. The production of oleoresin per hectare was higher in Rio-de-Janerio in comparison to Baruwa Sagar. In case of Urea concentration U_1 produced higher yield than U_0 in respect of NAA, as the concentration was increased from N_oN_1 and N_2 the production of Oleoresin per hectare was also found to increase in ascending orders.

Result and Discussion

Recovery of oleoresin

The oleoresin content was found more in variety Rio-de-Janeiro than the variety Baruwa Sagar. The recovery of oleoresin was more in U_1 (Urea 2%). In case of NAA application, the maximum oleoresin content was found in N_2 followed by N_1 and N_0. In case of interaction between Urea and NAA, the maximum oleoresin content was found in V_1 N_2 and minimum in U_0N_0.

The recovery of oleoresin was highest in Rio-de-Janeiro. The above finding is in close conformity with the findings of Natrajan et al., (1972), Lewis et al., 1972 and Mathai (1973).

The recovery percent of oleoresin was more in variety Rio-de-Janeiro. In case of Urea and NAA the maximum oleoresin percent was found in urea 2 percent and NAA 400 PPM.

Oleoresin production

The result showed that only the main effects of variety, urea and NAA were found to differ significantly in both the years. The data revealed that variety Rio-de-Janeiro produced more oleoresin than the variety Baruwa Sagar. The foliar application of urea also increased the production of oleoresin. Further, the maximum oleoresin content was obtained with the application of N_2 (NAA 400 PPM) followed by N_1 (NAA 200 PPM and N_0 (NAA OPPM).

These findings are nearly close to the finding made by Murlidharan et al., (1973b). He reported that variety Rio-de-Janeiro showed to contribute more than 200 Kg. of Oleoresin per hectare and quite suitable for processing industry. Besides varietal character other factors like use of urea and NAA as foliar spray might have also influenced in higher production of oleoresin content in ginger.

The oleoresin production in Kilogram per hectare showed the effect of variety, urea and NAA. The variety Rio-de-Janeiro produced more oleoresin content than Baruwa Sagar. The maximum oleoresin production was found in Urea 2 per cent and NAA 400 PPM.

Table 1: Mean recovery of oleoresin (Percent)

VxU

							Combined	
Treatments	**U_o**	**U_1**	**Mean**	**U_o**	**U_1**	**Mean**	**U_o**	**U_1**	**Mean**
V_1	5.17	5.70	5.43	5.14	5.52	5.33	5.15	5.61	5.38
V_2	5.54	5.97	5.76	5.50	5.74	5.62	5.52	5.85	5.69
Mean	5.36	5.83	5.60	5.32	5.63	5.48	5.34	5.73	5.53

VxN

Treatment	**N_o**	**N_1**	**N_2**	**Mean**	**N_o**	**N_1**	**N_2**	**Mean**	**N_o**	**N_1**	**N_2**	**Mean**
V_1	4.78	5.49	6.04	5.43	4.61	5.45	5.93	5.33	4.69	5.46	5.98	5.38
V_2	5.09	5.90	6.28	5.76	4.97	5.76	6.14	5.62	5.03	5.83	6.21	5.69
Mean	4.93	5.70	6.16	5.60	4.79	5.61	6.03	5.48	4.86	5.65	6.09	5.53

NxU

Treatments	**U_o**	**U_1**	**Mean**	**U_o**	**U_1**	**Mean**	**U_o**	**U_1**	**Mean**
N_0	4.44	5.43	4.93	4.47	5.11	4.79	4.46	5.27	4.86
N_1	5.62	5.78	5.70	5.58	5.63	5.61	5.60	5.70	5.65
N_2	6.01	6.30	6.16	5.92	6.15	6.03	5.96	6.23	6.09
Mean	5.36	5.83	5.60	5.32	5.63	5.48	5.34	5.73	5.53

Standard Error and Critical Difference

Comparison between means of	**S.E.(M) ±**	**C.D. at 5%**	**S.E. (M) ±**	**U.E. (M) ±**	**S.E.(M) ±**	**C.D. at 5%**
V	0.0480	0.1408	0.0535	0.1570	0.0356	0.1013
U	0.0480	0.1408	0.0535	0.1570	0.0367	0.1045
N	0.0588	0.1726	0.0655	0.1923	0.0431	0.1228
VU	0.0679	-	0.0757	-	0.0503	-
VN	0.0832	-	0.0928	-	0.0612	-
UN	0.0832	0.2439	0.0928	0.2721	0.0620	0.1765
VUN	0.1176	-	0.1312	-	0.0864	-

Table 2: Mean yield of Oleoresin (Kg/ha)

VxU

								Combined	
Treatments	**U_o**	**U_1**	**Mean**	**U_o**	**U_1**	**Mean**	**U_o**	**U_1**	**Mean**
V_1	326.60	358.73	342.67	314.69	337.43	326.06	320.65	348.08	334.36
V_2	359.60	386.70	373.15	350.51	364.17	357.14	355.06	375.44	365.25
Mean	343.10	372.72	357.91	332.60	350.80	341.70	337.85	361.76	349.81

VxN

Treatment	N_o	N_1	N_2	Mean	N_o	N_1	N_2	Mean	N_o	N_1	N_2	Mean
V_1	301.12	344.37	382.52	342.67	278.78	333.61	365.80	326.06	289.95	338.99	374.16	334.36
V_2	329.32	381.08	409.07	373.15	315.33	363.95	392.75	357.34	322.32	372.51	400.91	365.25
Mean	315.22	362.72	395.79	357.91	297.05	348.78	379.27	341.70	306.13	355.75	387.53	349.81

NxU

Treatments	U_o	U_1	Mean	U_o	U_1	Mean	U_o	U_1	Mean
N_0	295.18	335.26	315.22	286.02	308.09	297.05	290.60	321.67	306.13
N_1	353.66	371.79	362.72	345.36	352.20	348.78	349.51	361.99	355.75
N_2	380.48	411.11	395.79	366.43	392.12	379.27	373.45	401.61	387.53
Mean	343.10	372.72	357.91	332.60	350.80	341.70	337.85	361.76	349.81

Standard Error and Critical Difference

Comparison between means of	S.E.(M) ±	C.D. at 5%	S.E. (M) ±	C.D. at 5%	S.E.(M) ±	C.D. at 5%
V	5.3784	15.7753	3.9034	11.4489	3.2863	9.3601
U	5.3784	15.7753	3.9034	11.4489	3.3406	9.5147
N	6.5871	19.3203	4.7807	14.0219	3.9868	11.3495
VU	7.6070	-	6.7622	-	4.6496	-
VN	9.3175	-	5.5208	-	4.6496	-
UN	9.3175	-	6.7622	-	5.6500	-
VUN	13.1759	-	9.5624	-	7.9782	-

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