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RESEARCH ARTICLE

EFFECT OF PINCHING AND FOLIAR NUTRITION ON GROWTH AND YIELD OF DHAINCHA (*Sesbania rostrata* BREMEK & OBERM)

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ABSTRACT

Field experiment was conducted during kharif 2015 at Mondouri Teaching Farm and during kharif 2016 at Central Research Farm, Gayespur, Bidhan Chandra Krishi Viswavidyalaya, West Bengal to study the Effect of Pinching and Foliar Nutrition on Growth and Yield of Dhaincha (*Sesbania rostrata* Bremek & Oberm). The results indicated that pinching had significant effect on plant height (cm), number of primary branches plant $^{-1}$, number of pods plant^{-1}, pod yield plant^{-1} (g), seed yield plant^{-1} (g), and seed yield (kg ha $^{-1}$). Among the different treatments through foliar spray the characters maturity days, number of pods plant^{-1}, pod yield plant $^{-1}$, seed yield plant $^{-1}$ and seed yield (kg ha $^{-1}$) showed significant values. The treatment N_4 *i.e.* foliar spray with DAP (2%)+ Micronutrients Mixture (ZnSO4 0.5%+Boric Acid 0.3%) + NAA 40 PPM showed highest seed yield of 1416.7 & 1062.5 kg ha $^{-1}$ in 2015 & 2016 respectively followed by N_3 *i.e.* foliar spray with NAA 40 PPM with seed yield of 1294.6 kg ha $^{-1}$ in 2015 and 970.9 Kg ha^{-1} in 2016 respectively.

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INTRODUCTION

Dhaincha (*Sesbania rostrata* Bremek & Oberm) belongs to family fabaceae is an erect, soft, woody annual or short-lived perennial plant primarily used as green manure crop before transplanted rice. It is also used as trap crop for insects pest in soybean, livestock feed and fuel. Dhaincha is a short day plant with a critical photoperiod of 12-12.5 hours. Seed can be produced when day lengths are shorter than 11 hours. Pinching of terminal buds is carried out two months after sowing to encourage more branching along with improved seed yield.

The present day agriculture is primarily based on high cropping intensity with abundant use of chemical fertilizers that deteriorates the soil physical, chemical and biological properties. Green manuring, a part of organic farming builds soil fertility status by improving humas, organic carbon, nitrogen and microbial growth thereby increase the supply of nutrients available to plants. In this respect dhaincha is a potential green manure crop which adds 8-21 tonnes of green matter and 42-95 kg N ha $^{-1}$(Mishra and Nayak 2004). Since quality seed plays an important role in biomass as well as seed production of agricultural crops, the present investigation was carried out to study the effect of pinching and foliar nutrition on quality seed production of dhaincha to improve the potentiality of the crop for more biomass as well as seed production.

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MATERIALS AND METHODS

A field experiment was carried out during kharif 2015 at Mondouri Teaching Farm and during kharif 2016 at Central Research Farm, Gayespur, Bidhan Chandra Krishi Viswavidyalaya, West Bengal to study the Effect of Pinching and Foliar Nutrition on Growth and Yield of Dhaincha (*Sesbania rostrata* Bremek & Oberm). The research stations are located at a height of 9.75 m above sea level (23.5^0 N latitude and 89^0 E longitude).Experiment was laid out in split-plot design with first factor at levels *viz.* pinching of terminal bud (P_1) and non pinching of terminal bud (P_0) as main plot treatments. The second factor with five schedules of foliar spray *viz.* foliar spray with DAP 2% (N_1), foliar spray with MN Mixture ($ZnSO_4$ 0.5%+Boric Acid0.3%) (N_2), foliar spray with NAA 40 PPM (N_3), foliar spray with DAP 2%+ MN Mixture +NAA (N_4) and Control (N_0) was laid out as sub plot treatments with four replications. The soil of the experimental site is clayey in texture with pH 6.5. Basal fertilizers @ 30 kg N and 50 kg P_2O_5 ha^{-1} was applied at the time of sowing. Crop was planted at a spacing of 60cm row to row and 20 cm plant to plant. The sowing was done on 13.08.2015 and 31.07.16 and harvested on 08.12.2015 and 17.12.2016. Recommended agronomic packages and plant protection practices were adopted for raising the crop. Pinching of terminal bud was done at 60 days after sowing and foliar sprays were given at flowering time. Data on various variables were analysed by analysis of variance (Panse and Sukhatme, 1967).

RESULTS AND DISCUSSION

Effect of pinching and foliar nutrition on growth parameters

The character days to 50% flowering was not significantly influenced by pinching and foliar nutrition in both the years (Table 1).

Table 1. Effect of pinching and foliar nutrition on growth parameters of seed crop Dhaincha

Treatments	Days to 50% flowering		Days to maturity		Plant Height (cm)		Primary Branch/plant	
	1st year	2nd year	1st year	2nd year	1st year	2nd year	1st year	2nd year
Pinching effects (P)								
P_1	53.9	57	116.6	130.6	184.3	263.7	14.0	11.9
P_0	53.3	55.9	116.7	129.6	203.0	285.7	10.7	9.1
S Em (±)	0.60	0.52	0.61	0.41	5.56	3.02	0.35	0.65
CD (P=0.05)	NS	NS	NS	NS	16.32	8.77	1.03	1.90
Foliar Nutrition (N)								
N_1	53.8	54.8	113.9	128.9	202.4	273.4	12.9	9.4
N_2	53.4	56.4	114.1	129.1	190.3	276.7	12.1	9.5
N_3	53.8	57.1	120.8	132.6	192.7	278.2	12.4	9.9
N_4	54.0	57.0	120.1	131.5	188.9	277.2	13.0	10.9
N_0	53.0	56.9	114.3	128.3	194.0	268.1	11.4	12.8
S Em (±)	0.95	0.82	0.96	0.65	8.89	4.78	0.56	1.03
CD (P=0.05)	NS	NS	2.80	1.90	NS	N S	NS	NS
Interaction (PXN)								
S Em (±.)	1.34	1.15	1.36	0.93	12.57	6.75	0.79	1.46
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS

P_1-With pinching, P_0- Without pinching, N_1-DAP Spray (2%), N_2- MN (Micronutrient Mixture) Spray ($ZnSO_4$ @ 0.5% + Boric Acid @0.3%), N_3-NAA Spray (40ppm), N_4-DAP Spray (2%)+ MN Spray ($ZnSO_4$ @ 0.5% + Boric Acid @0.3%) + NAA Spray (40ppm), N_0-control

Days to 50% flowering were almost similar irrespective of pinching and foliar spray of dhaincha which ranges from 53 to 54 days in the first year and 54.8 to 57.1 days in the second year. This may be due to photoperiod sensitive nature of the crop as the crop flowers when the critical day length is below 11 hours (Lokesh *et al.* 2015). Days to maturity of dhaincha as influenced by pinching and foliar spray are presented in Table 1 showed that the character days to maturity was not significantly influenced by the effect of pinching whereas foliar spray had a significant role. In the first year, maturity days was 116.7 for without pinching treatment which was statistically at par with the pinching treatment (116.6 days). Similarly in the second year, no significant difference was found between the number of days to mature the plants of pinching treatment (130.6 days) and without pinching treatment (129.6 days).

In the first year, among the different foliar applications, N_3 i.e. NAA (40ppm) treated plants took maximum days to mature (120.8 days) followed by N_4 (120.1 days) treated plants, though influence of these two treatments was statistically at par with each other. The other three treatments influenced this parameter in significantly similar manner. In the same way, N_3 (132.6 days), N_4 (131.5 days) took significantly more number of days to mature than the other treatments in the second year. Plants of N_3 and N_4 treated plots matured later than the other treatments. This may be due to the effect of NAA which delays the maturity of plant, increase photosynthetic activity and effective translocation of photosynthates to sink there by resulted in better development of capsules, good seed filling and consequently higher yield also. Table 1 reveals that plant height was significantly influenced by pinching where different foliar applications had no significant role. Higher plant height was observed in the treatment without pinching (203 cm) and it was significantly higher than pinching treatment (184.3 cm) in 2015. Similar result was also recorded in the second year where average plant height for without pinching plots (285.7 cm) was significantly higher than pinching plots (263.7 cm). The higher plant height noticed in without pinching treatment was mainly due to the fact that plants were not pinched and as such plants grew to their original height without reduction. The reduction in the height with pinching treatment was due to the effect of breaking the apical dominance and hence consequential increase in number of lateral branches. This is due to retardation of transverse cell division particularly in cambium which is the zone of meristematic activity at base of the inter node (Grossman 1990). Similar findings were also reported in China aster (Aswath *et al.* 1994) and in African marigold (Kandelwal *et al.* 2003). Analysis of variance showed that foliar applications had no significant role on plant height. However N_1 treatment in the first year and treatment N_3 in the second year recorded highest plant height (202.4 and 278.2 cm respectively). Effect of pinching and foliar application on number of primary branches per plant presented in Table 1 revealed that in both the years higher number of branches per plant was recorded with pinching treatment *i.e.* P_1 and that was significantly higher than without pinching treatment *i.e.* P_0. This is because the apical dominance was broken due to pinching of terminal bud. Pinching of the dhaincha crop might have diverted all the food material and led to higher biomass production resulting from more plant growth and development (Kumar and Srivastava 2013). Removal of apical dominance might have promoted the development of lateral buds thereby resulting in increased branches per plant (Pathania *et al.* 2000). The terminal bud pinching practice might have efficiently altered the crop architecture by activating the lateral dormant buds through arresting the terminal growth which in turn increased the lateral branches that led to greater development of source and sink features in sesame and thereby facilitating the significant increase in yield (Singh *et al.* 2013, Kokilavani *et al.* 2007). Foliar application had no such significant effect on number of primary branches per plant though treatment N_4 and N_0 recorded the highest number of primary branch per plant (13 and 12.8) during first and second year respectively.

Effect of pinching and foliar nutrition on seed yield and yield contributing parameters

Effect of pinching and foliar nutrient (Table 2) revealed that number of pods per plant was significantly influenced by both

Table 2. Effect of pinching and foliar nutrition on yield and yield contributing parameters of seed crop Dhaincha

Treatments	No. of Pod /Plant		Pod yield (g/plant)		No of Seed /pod		Seed yield (g/plant)		1000 seed weight (g)		Seed yield (kg/ha)	
	1st year	2nd year	1st year	2nd year	1st year	2nd year	1st year	2nd year	1st year	2nd year	1st year	2nd year
Pinching effects (P)												
P_1	41.4	29.4	26.1	18.6	25.5	22.4	16.2	12.7	20.4	22.6	1300.1	974.4
P_0	32.9	22.7	23.8	15.4	26.0	22.8	13.6	10.5	20.0	21.9	1081.4	811.0
S Em (±)	1.02	1.39	0.56	0.38	0.39	0.81	0.24	0.29	0.28	0.26	12.90	9.05
CD (P=0.05)	2.95	4.04	1.62	1.10	NS	NS	0.70	0.84	NS	NS	37.43	26.27
Foliar Nutrition (N)												
N_1	34.5	25.2	22.5	15.2	25.4	22.3	14.2	10.0	20.7	22.6	1127.2	835.4
N_2	36.6	25.7	24.5	15.9	26.7	23.7	13.9	10.5	19.9	21.9	1108.0	839.3
N_3	39.3	27.5	27.7	19.1	25.6	22.8	16.0	13.6	21.3	22.6	1294.6	970.9
N_4	42.0	28.0	29.2	20.4	26.1	23.8	17.6	14.3	20.0	22.9	1416.7	1062.5
N_0	33.3	23.8	20.9	14.4	25.1	20.6	12.9	9.8	19.2	21.2	1007.2	755.4
S Em (±)	1.61	2.20	0.88	0.60	0.62	1.28	0.38	0.46	0.44	0.41	20.40	14.32
CD (P=0.05)	4.66	NS	2.56	1.74	NS	NS	1.10	1.32	1.27	1.18	59.19	41.54
Interaction (PXN)												
S Em (±)	2.27	3.11	1.25	0.85	0.87	1.81	0.54	0.65	0.62	0.57	28.85	20.25
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	83.70	58.75

P_1-With pinching, P_0- Without pinching, N_1-DAP Spray (2%), N_2- MN (Micronutrient Mixture) Spray ($ZnSO_4$ @ 0.5% + Boric Acid @0.3%), N_3-NAA Spray (40ppm), N_4-DAP Spray (2%)+ MN Spray ($ZnSO_4$ @ 0.5% + Boric Acid @0.3%) + NAA Spray (40ppm), N_0-control

pinching and foliar nutrition. In the first year, maximum number of pods per plant was observed in pinching treatment (41.4) which was significantly higher than the without pinching treatment (32.9). Similarly during second year, significantly higher number of pod per plant was recorded in pinching treatment (29.4) than the without pinching plots (22.7). Results of the present experiment signify the better performance of pinching as it reduced plant height compared to control. The effectiveness of pinching may probably be due to the change induced in the rate of cell division in the meristematic region (Ahmad *et al*. 2007) thereby reducing the plant height promoting the development of increased number of healthy branches and flowers (Pathania *et al*. 2000) resulting in increase in the pod number. Further, the effectiveness of chemicals on pod production might be due to their retarding effect on apical growth, which in turn encouraged side branches (Ahmad *et al*. 2007). In the first year experiment, among different foliar applications, significantly highest number of pods per plant (42.0) was recorded with foliar spray with DAP (2%) + MN Spray ($ZnSO_4$ @ 0.5% + Boric Acid @0.3%) + NAA Spray (40ppm) i.e. N_4 followed by N_3, N_2, N_1 and N_0. Where Performance recorded after N_4 and N_3 was statistically at par. While in the next year experiment foliar applications showed non-significant effect on number of pods per plant, though numerically N_4 (28.0) recorded the highest result followed by N_3, N_2, N_1 and N_0. The significant increases in number of pods per plant with foliar application of DAP, Zn, boron and NAA could be attributed to increase assimilate translocation rate to the developing sink leading to formation of more number of effective pods. These nutrients and growth hormone play an important role in various physiological and biochemical processes and might contribute to the growth of the meristematic regions (Cakmak *et al*. 2000) and enhancing growth of plants in green gram (Elamathi and Pradeep 2007). Boron plays an important role in cell division, cell differentiation, development, calcium utilization, translocation of photosynthates and growth regulators from source to sink, which in turn helps in maintaining higher leaf area, leaf area index and higher number of pods and pod weight $plant^{-1}$ (Kalyani *et al*. 1993). Further, boron plays an important role in preventing flower and pod drop, thereby retaining higher number of pods $plant^{-1}$ (Seifinadergholi *et al*. 2011). Similarly, Torun et al. (2001) reported increase in biological yield for foliar application of zinc. The results also agreed with Grewal *et al.* (1997).

NAA delays maturity, reduce flower drop increase photosynthetic activity and effective translocation of photosynthates to sink thereby resulted in better development of capsules, good seed filling and consequently higher yield reported by Sharma and Dey (1986) in green gram. Foliar spray of DAP, NAA combined with micronutrients registered higher grain yield of groundnut. The causes for the increase in yield were the increased dry matter production and efficient assimilate translocation to the developing sink leading to increased pods and higher seed yield (Revanthy *et al*. 1997). Data pertaining to pod yield per plant (g) revealed that pod yield $plant^{-1}$ was significantly influenced by both pinching and foliar applications (Table 2). Perusal of Table 2 revealed that pod yield per plant (g) in pinching treatment (26.1 g during first year and 18.6 g during second year) was significantly higher than the without pinching treatment (23.8 g and 15.4 g). Removal of terminal buds breaks the apical dominance and induces development of lateral branches thereby increasing the sites for pod development. The practice of topping has proved to be effective in increasing the yield levels of different crops like jute (Bhattacharjee and Mitra 1999) and Indian mustard (Singh *et al.* 2013). In both the years foliar nutrition had also significant effect on pod yield per plant. Highest pod yield was recorded with foliar spray of DAP (2%) + MN Spray ($ZnSO_4$ @ 0.5% + Boric Acid @0.3%) + NAA Spray (40ppm) *i.e.* N_4 treatment followed by N_3, N_2, N_1 and N_0 where the performance of N_4 and N_3 was statistically at par in both the years. Maximum pod yield is due to application of DAP, zinc, boron and NAA which increased the pod number, reduced flower drop and increased yield in ground nut (Revanthy *et al.* 1997). Number of seed per pod (Table 2) revealed that number of seed per pod was not influenced by pinching or foliar applications. Though without pinching treatment recorded higher number of seed per pod than the pinching treatment in both the year, there was no significant differences.

These results are in agreement with Tripathi *et al.* (2013) who reported that different topping practices in sunnhemp did not exert any significant influence on number of seeds pod^{-1} and test weight. In the first year experiment, number of seeds per pod was maximum with micronutrient Mixture Spray ($ZnSO_4$ @ 0.5% + Boric Acid @0.3%) *i.e.* treatment N_2 (26.7) and lowest result was recorded after control *i.e.* N_5 treatment (25.1) with no significant differences. In the second year experiment, N_4 recorded highest number of seed per pod (23.8) followed by

N_2, N_3, N_1 and N_0. The analysed data on influence of pinching and foliar applications on seed yield plant^{-1} (g) are presented in Table 2 revealed that significantly higher seed yield per plant was recorded in P_1 i.e. pinching treatment (16.2 g) than without pinching treatment (13.6 g) in 2015. Similar results were also recorded in the next year with 12.7 g seed yield per plant in pinching treatment and 10.5 g for without pinching treatment. The increased seed yield due to apical pinching of plants can be attributed to the proportionate increase in yield contributing characters i.e., more number of productive branches and more number of flowers per plant. Similar results were reported by Venkata Reddy *et al.* (1997) in okra, Malik *et al.* (1999) in onion, Vyakarnahal *et al.* (2001) in sunflower, Sajjan *et al.* (2002) in okra. Rakesh *et al.* (2003) in chrysanthemum. Among the different foliar applications, N_4 recorded highest result in both the years which was significantly better than the other treatments.

Highest seed yield is due to more number of pods per plant resulting more seed yield. Yield is the ultimate economic produce of the crop which is determined by number of pods, seed weight as governed by the management practice and its native genetic potential. The data pertaining to seed yield of dhaincha crop influenced by pinching and foliar nutrition and interaction effects are presented in Table 2. Analysis of variance on pinching and foliar nutrient revealed that seed yield was significantly influenced by both pinching and foliar nutrition. Data pertaining to 1000 seed weight (test weight) of the produce obtained from dhaincha crop as influenced by pinching and foliar nutrition are presented in Table 2. Pinching has no significant effect on 1000 seed weight though higher 1000 seed weight was observed in pinching treatment (20.4 g) than without pinching one (20.0 g) in the year 2015. In 2016 pinching treatment recorded 22.6 g for 1000 seed weight and 21.9 g was recorded for without pinching treatment. Similar observations were also recorded by Tripathi *et al.* (2013) who reported that different topping practices in sunhemp did not exert any significant influence on number of seeds pod^{-1} and test weight. Higher seed yield was recorded with pinching treatment (1300.1 Kg/ha in 2015 and 974.4 Kg/ha in 2016) that was significantly superior to without pinching treatment (1081.4 kg/ha in 2015 and 811.0 Kg/ha in 2016). The maximum yield observed under the effect of pinching might be attributed to growth characteristics which resulted in considerable improvement in yield attributing characters like pods plant^{-1} and seed yield plant^{-1} and finally reflected into yield. Further, more branches plant^{-1} under pinching treatment might have had multiplicative effect on seed yield. The increase in seed yield recorded with pinched plants may be attributed to diversion of photosynthates and metabolites produced by leaves to strong carbohydrate sinks (pods) when compared to meristem in un pinched plants (Tripathi *et al.* 2013). The results are in confirmity with the findings of Bhattacharjee and Mitra (1999) and Lakshmi *et al.* (1995) in Mesta, Kathiresan and Duraisamy (2001) in *Sesbania*. Pinching helps to reduce the apical dominance. Thereby affect the translocation of photosynthates to the reproductive parts. Pinching of apical bud has been found to increases the number of branches, pod set per cent and better source-sink relation in pigeon pea, thereby enhancing the yield of plant (Sharma *et al.* 2003).

Among different foliar treatments, N_4 i.e. foliar spray of DAP (2%) + MN Spray ($ZnSO_4$ @ 0.5% + Boric Acid @0.3%) + NAA Spray (40ppm) reported highest seed yield per hectare in both the years which was significantly higher than the other treatments. During first year, highest seed yield per hectare was recorded with N_4 (1416.7 Kg/ha) followed by N_3, N_1, N_2 and N_0. While statistically similar performance was shown by N_2 and N_1. In the nest year, highest yield was recorded with N_4 (1062.5 Kg/ha) followed by N_3, N_2, N_1 and N_0.

The superiority in performance might be attributed to the prolonged assimilation activity of leaves thereby ensuring a considerable yield advantage (Vasilas *et al.* 1980). Further, the foliage applied nutrients at the critical stages of the crop were effectively absorbed by the plant and translocated to the developing pods, producing more number of pods, more filling and higher yield. Significant improvement in seed yield with spray of DAP, NAA and micronutrients like zinc and boron indicate that these nutrients play an important role in several enzymatic processes and are necessary for growth and development of the crop. They further contribute to increased branches, pods and seed yield. This could be attributed to the fact that boron plays an important role in cell divisions, cell differentiation, development, calcium utilization, translocation of photosynthates and growth regulators from source to sink, and help in maintaining higher leaf area, leaf area index and higher number of pods plant^{-1} (Kalyani *et al.*1993). It also helps in preventing flower drop, pod drop and there by maintaining higher number of pods plant^{-1}. Observed yield advantage in response to the application of NAA which delays maturity may be attributed to the prolonged canopy life of the plant which enables the plant to produce adequate photo assimilates for an extended period. Revanthy *et al.* (1997) Reported that foliar spray of DAP, NAA combined with micronutrients registered higher grain yield. The causes for the increase in yield were the increased dry matter production and efficient assimilate translocation to the developing sink leading to increased pods and higher seed yield. Significant differences were also recorded by different treatment combinations. Where treatment combination P_1N_4 i.e. pinching in combination with foliar spray of DAP (2%) + Micronutrient mixture ($ZnSO_4$ @ 0.5% + Boric Acid @0.3%) + NAA (40ppm) recorded highest result of 1523.5 kg/ha seed yield in 2015 and 1142.6 kg/ha seed yield in 2016. And lowest seed yield was recorded after treatment combination P_0N_0.

Effect of pinching and foliar nutrition on seed quality parameters

Germination percentage of dhaincha seeds as influenced by both pinching and foliar application are presented in Table 3, indicated that germination percentage did not differ significantly by the effect of pinching. Though numerically higher value of germination percentage was recorded in pinching treatment (75.8 %) than without pinching (73.0 %) plots. Non significant differences were found on germination percentage among the different foliar applications. Average seedling length influenced by pinching and foliar nutrition is presented in Table 3 revealed that Pinching treatment had no significant effect on seedling length of dhaincha. Among different foliar applications, highest seedling length was recorded by N_4 (27.9 cm) which was significantly higher than the control i.e. N_0. The performance of other three sub treatments i.e. N_1, N_2 and N_3 were statistically on par with the N_4 treatment. Vigour index of the seedlings (Table 3) indicated that seedling vigour index was non-significantly influenced by pinching as well as by different foliar applications.

Table 3. Effect of pinching and foliar nutrition on yield and yield contributing parameters of seed crop Dhaincha

Treatments	Germination percentage	Seedling length	Vigour Index
Pinching effects			
P_1	75.8	27.0	2049.3
P_0	73.0	27.1	1980.0
S Em (±)	1.69	0.51	61.03
CD (P=0.05)	NS	NS	NS
Foliar Nutrition			
N_1	75.5	27.4	2065.7
N_2	73.9	27.8	2053.8
N_3	75.1	27.6	2080.4
N_4	75.5	27.9	2112.6
N_0	72.0	24.4	1760.9
S Em (±)	2.68	0.81	96.50
CD (P=0.05)	NS	2.34	NS
Interaction (PXN)			
S Em (±.)	3.78	1.14	136.47
CD (P=0.05)	NS	NS	NS

P_1-With pinching, P_0- Without pinching, N_1-DAP Spray (2%), N_2- MN (Micronutrient Mixture) Spray ($ZnSO_4$ @ 0.5% + Boric Acid @0.3%), N_3-NAA Spray (40ppm), N_4-DAP Spray (2%)+ MN Spray ($ZnSO_4$ @ 0.5% + Boric Acid @0.3%) + NAA Spray (40ppm), N_0-control

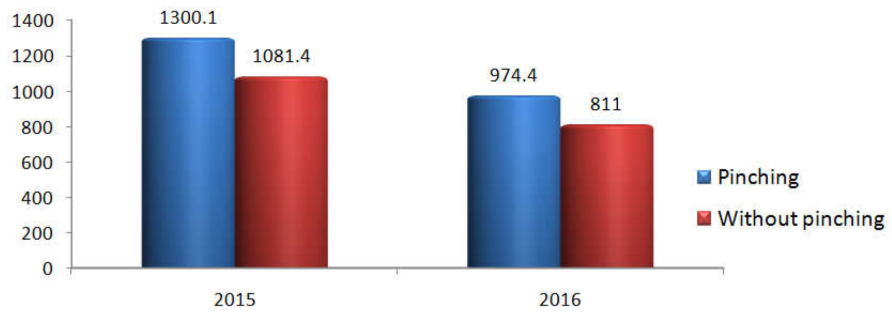

Fig.1. Effect of pinching on seed yield ha^{-1} (Kg) of dhaincha

Fig. 2. Effect of foliar nutrition on seed yield ha^{-1} (Kg) of dhaincha

Though pinching did not make any significant difference, numerically vigour index was observed maximum with pinching treatment (2049.3). Among the foliar nutritions, maximum vigour index was recorded with N_4 followed by N_3, N_1, N_2 and N_0.

Conclusion

The experiment revealed that pinching had significant effects on plant height (cm), number of primary branches per plant, number of pods per plant, pod yield per plant (g), seed yield per plant (g), seed yield (Kg/ha). Among the foliar treatments, N_4 i.e. foliar spray with DAP (2%)+ Micro nutrient Spray ($ZnSO_4$ @ 0.5% + Boric Acid @0.3%) + NAA Spray (40ppm) had highest significant effect on seed yield (Fig 1 and 2). Among the seed quality characters, seedling length of dhaincha was effectively influenced by the foliar applications. The present investigation revealed differential interaction effect of pinching and foliar applications on the character seed yield (Kg/ha) where best result was recorded after P_1N_4 i.e. pinching in combination with foliar spray of DAP (2%) + Micro nutrient Spray ($ZnSO_4$ @ 0.5% + Boric Acid @0.3%) + NAA Spray (40ppm). For production of higher seed yield and better quality seeds, pinching should be done at 60 days after sowing in case of dhaincha. Foliar application of DAP Spray (2%) + Micro nutrient Spray ($ZnSO_4$ @ 0.5% + Boric Acid @0.3%) + NAA Spray (40ppm) should be given at flowering time. Therefore, it can be concluded that pinching of the dhaincha crop at 60 days after sowing in combination with foliar spray of DAP (2%) + Micro nutrient Spray ($ZnSO_4$ @ 0.5% + Boric Acid @0.3%) + NAA Spray (40ppm) may be followed as an effective technique for obtaining high quantity and better quality seeds of dhaincha.

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