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Effect of planting date and chemical desuckering on sucker growth, yield and yield attributes of bidi tobacco (*Nicotiana tabacum* L.)

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Abstract

The present investigation was carried out to study the effect of planting date and chemical desuckering on sucker growth, height and leaf area of bidi tobacco varieties (*Nicotiana tabacum* L.). The field experiment was laid out in Factorial Randomized Block Design (FRBD) with three replications comprising twelve treatment combinations of two varieties (GT 7 and GABT 11), two suckericides treatments (hand desuckering and pendimethalin @ 0.45 % + 2 % urea) and three transplanting dates (3rd week of August, 1st week of September and 3rd week of September). The chemical suckericide pendimethalin @ 0.45 % + 2 % urea significantly improved growth parameters viz., leaf area, dry weight per unit leaf area as compared to hand desuckering at 135 DAT and at harvesting stages. Pendimethalin @ 0.45 % + urea 2 % treatment also significantly controlled the axillary and ground suckers.

Keywords: tobacco, chemical desuckering, pendimethalin, 2% urea, leaf area, suckers

Introduction

Tobacco is a low-volume and a high value commercial crop, providing livelihood to millions of people. Tobacco cultivation, processing and manufacture are a source of employment to about 36 million people in the country. India occupies second place in tobacco production and exports. The crop is grown in an area of 0.45 M ha (0.27% of net cultivated area) and contributes about Rs. 24000 crores to the national exchequer through foreign exchange and internal excise revenue. In India area under tobacco cultivation is about 4.17 lakh hectares with a production of 681 million kg. Among these Gujarat state ranks second in area (1.58 lakh hectares) with a production of 278 million kg (Anon., 2013)^[2].

The major thrust area of tobacco research is to improve the productivity and quality in context to demand at national and international market. An increase in the yield of crop can be brought forward either by increasing the area under cultivation or by increasing the productivity per unit area. Since the area is limited, yield level per unit area has to be increased. The study of the physiology and physiological parameters of the bidi tobacco can help to increase the production and productivity of bidi tobacco.

Yield being a complex character involves a number of morpho-physiological characters. It can be predicted on the basis of performance of yield components that these characters are genetically correlated with yield. Correlation between various characters is of great value as it indicates the degree to which various characters of a plant are associated with the economic productivity.

The sucker control in tobacco is must for increasing yield and improving quality of the produce. Suckers are developed from the leaf axil just after topping of tobacco plants. These unwanted suckers compete for food, light, moisture and space. In bidi tobacco, due to its high requirements of nitrogen fertilizers, the desuckering problem is more acute as compared to other types of tobacco. These suckers should be removed by hand or by chemical desuckering before they become large enough to retard the development of the leaves. To reap maximum benefit, suckers should be removed periodically.

Materials and Methods

The present investigation was carried out at Bidi Tobacco Research Station, Anand Agricultural University, Anand (Gujarat) during the year 2016-17 to study the influence of planting date and chemical desuckering on sucker growth, height and leaf area of bidi tobacco

varieties (*Nicotiana tabacum* L.). The field trial was laid out in FRBD with three replications. Two tobacco improved

varieties were selected for the research experiment viz., GT-7 and GABT-11.

Table 1: Treatment combinations

Sr. No.	Treatment combinations	Treatments
T ₁	GT 7 + hand desuckering + 3 rd week of August planting	(V ₁ S ₁ D ₁)
T ₂	GT 7 + hand desuckering + 1 st week of September planting	(V ₁ S ₁ D ₂)
T ₃	GT 7 + hand desuckering + 3 rd week of September planting	(V ₁ S ₁ D ₃)
T ₄	GT 7 + pendimethalin @ 0.45 % + 2 % urea + 3 rd week of August planting	(V ₁ S ₂ D ₁)
T ₅	GT 7 + pendimethalin @ 0.45 % + 2 % urea + 1 st week of September planting	(V ₁ S ₂ D ₂)
T ₆	GT 7 + pendimethalin @ 0.45 % + 2 % urea + 3 rd week of September planting	(V ₁ S ₂ D ₃)
T ₇	GABT 11 + hand desuckering + 3 rd week of August planting	(V ₂ S ₁ D ₁)
T ₈	GABT 11 + hand desuckering + 1 st week of September planting	(V ₂ S ₁ D ₂)
T ₉	GABT 11 + hand desuckering + 3 rd week of September planting	(V ₂ S ₁ D ₃)
T ₁₀	GABT 11 + pendimethalin @ 0.45 % + 2 % urea + 3 rd week of August planting	(V ₂ S ₂ D ₁)
T ₁₁	GABT 11 + pendimethalin @ 0.45 % + 2 % urea + 1 st week of September planting	(V ₂ S ₂ D ₂)
T ₁₂	GABT 11 + pendimethalin @ 0.45 % + 2 % urea + 3 rd week of September planting	(V ₂ S ₂ D ₃)

Suckericide treatments

The tobacco plants were topped when they reached the button stage. After topping the buds in the axils of the leaves become active and there after suckers emerged in the axils of the leaves. These active lateral branches/suckers were removed by hand or by chemical desuckering before they become large enough to retard the development of leaves. These sucker were removed periodically. The process of removing these suckers commence after 6-7 days of topping operation and continued for 5-6 times. (Singh 2010) [12].

Hand desuckering:

Axillary suckers as well as ground suckers were removed by hand from the axil/base of the leaves.

Chemical desuckering

To avoid time consuming, laborious and more expensive process of hand desuckering, chemical desuckering was done. Chemical suckericide, Pendimethalin @ 0.45% + 2% Urea (75 ml stomp 30% EC + 100 g urea dissolved in water and made final volume as five litre) was applied in the leaf axils just after topping to suppress the emergence of suckers. Urea increases the efficiency of chemicals which could be attributed to better retention at the point of application as urea might help in increasing the succulence of cells, resulting in better contact action of chemical suckericides (Patel *et al.*, 2004).

Number and weight of axillary suckers:

The axillary suckers were removed periodically after a week of suckericides application. These were counted and fresh weighed from each replication and treatment.

Number and weight of ground suckers:

The ground suckers were removed periodically after their emergence. These were counted and fresh weighed from each replication and treatment.

Result and Discussion

The plant height of bidi tobacco at harvesting as influenced by different varieties, suckericide and transplanting date are presented in table 1. Plant height was significantly highest in the variety GABT 11 (68.30 cm) at harvesting. The varietal differences in plant height might be due to genetically efficient character of the variety. Plant height was significantly highest in 1st week of September (D₂) (68.70 cm) at harvesting. This might be due to good day length and

favourable climatic conditions received during transplanting date (D₂). These findings were in accordance with the work of Chavda (1998) [3], Patidar (2007) [9] and Dave (2012) [5] in bidi tobacco and Syed *et al.* (2008) [15] in Virginia tobacco. Differences in plant height due to the application of suckericides were found to be non-significant. However, numerically higher plant height was recorded in Chemical desuckering (65.58 cm) at harvesting. Similar results were also observed by Anon. (2003) [1] and Patel *et al.* (2004) [7] in bidi tobacco.

The leaf area per plant at harvesting recorded significantly highest in the variety GABT 11 (3.04 m²). Differences in leaf area among the different varieties might be due to genotypical character of the varieties which results in the higher leaf length and breadth. The varietal differences in leaf area per plant were also reported by Chavda (1998) [3] and Shamal (2012) [11] in bidi tobacco. The suckericide treatment Pendimethalin @ 0.45% + 2% Urea recorded numerically highest leaf area per plant (2.88 m²) at harvesting. Suckericide treatments suppress the reproductive growth and results in higher vegetative growth with higher dimensions of leaves. Similar results were found by Singh *et al.* (1999) [13] in chewing tobacco and Jehan *et al.* (2007) [6] in FCV tobacco. Leaf area per plant was highest in the transplanting date D₂ (2.85 m) at harvesting. These findings were similar to the previous results given by Anon. (2003) and Patel *et al.* (2004) [7] in bidi tobacco.

The results regarding specific leaf weight (SLW) indicated significant difference among bidi tobacco varieties, while suckericide levels, planting date showed non-significant difference. It also represents the leaf thickness which indicates better quality of leaf. The variety GABT 11 recorded significantly highest SLW (7.60 g/m²) at harvesting stage. Numerically higher SLW was recorded in Pendimethalin @ 0.45 % + 2 % urea treatment (7.18 g/m²) at harvesting.

The variety GABT 11 gave significantly highest cured leaf yield (2880 kg/ha) as compared to GT 7 (2011 kg/ha). The varietal differences in cured leaf yield might be due to different growth habits of different varieties due to their genetically efficient characters. These results are in the accordance with Syed *et al.* (2008) [15], Syed *et al.* (2009) [14] and Patel (2013) [8] in *Nicotiana tabacum* varieties. Chemical suckericide treatment pendimethalin @ 0.45% + 2% urea significantly increased the cured leaf yield (2605 kg/ha). Chemical suckericide treatments produce higher total dry matter of leaf due to suppression of axillary and ground suckers, produced photosynthates transferred to vegetative

plant parts mostly in the leaves. And also due to higher leaf length and breadth and thereby leaf area as well as thickness of leaves. Chavda *et al.* (2007)^[4] found that application of pendimethelin @ 0.45% + 2 % urea increased cured leaf yield about 10.9% than hand desuckering in bidi tobacco at Anand. These results are in accordance with the results obtained by

Patel *et al.* (2004)^[7] and Jehan *et al.* (2007) in *Nicotiana tabacum*. The transplanting date D₂ (1st week of September) recorded significantly highest cured leaf yield (2540 kg/ha) as compared to D₃ (3rd week of September) but remained at par with D₁ (3rd week of August).

Table 1: Effect of planting date and chemical desuckering on plant height, leaf area per plant and cured leaf yield at harvesting stage of growth in bidi tobacco varieties.

Treatments	Plant height (cm)	Leaf area/ plant (m ²)	specific leaf weight (g/m ²)	Cured leaf yield (kg/ha)
Varieties (V)				
GT 7 (V ₁)	61.55	2.50	6.74	2011
GABT 11 (V ₂)	68.30	3.04	7.60	2880
S. Em. ±	1.547	0.058	0.145	63.0
C. D. (P = 0.05)	4.538	0.172	0.425	184.60
Suckericides (S)				
Hand desuckering (S ₁)	64.26	2.66	7.16	2286
Chemical desuckering (S ₂)	65.58	2.88	7.18	2605
S. Em. ±	1.263	0.047	0.118	51.443
C. D. (P = 0.05)	NS	NS	NS	150.93
Transplanting date (D)				
3 rd week of August (D ₁)	63.00	2.76	7.19	2513
1 st week of September (D ₂)	68.70	2.85	7.22	2540
3 rd week of September (D ₃)	63.075	2.70	7.09	2283
S. Em. ±	1.547	0.058	0.15	63.03
C. D. (P = 0.05)	4.538	NS	NS	184.86
Sig. Interactions	V×D	-	-	V × D
CV %	8.3	7.3	7.0	8.9

Number and weight of axillary suckers /plot

The variety GTBT 11 had significantly lowest number and weight of axillary suckers (146.38 and 0.72 kg/plot, respectively).as compared to variety GT 7 (177.27 and 0.90 kg/plot, respectively). It might be due to different growth habits of genotypes due to their genetically efficient characters. The suckericide treatment significantly recorded the lowest number and weight of axillary suckers (27 and 0.15 kg/plot, respectively). Contact type suckericide Pendimethalin was used to prevent the sucker growth which appear to

desiccate tender sucker tissue by dissolving the cuticular layer. Thompson, (2001)^[16] reported chemical suckericides reduced the number and weight of suckers by 84-90 % and 78-89%, respectively as compared to hand desuckering in *Nicotiana tabacum* L. These results are also in the accordance with Anon. (2003), Patel *et al.* (2004)^[7] in bidi tobacco and Jehan *et al.* (2007)^[6] in FCV tobacco. Irrespective of the transplanting date, on an average, D₂ recorded lowest number weight of axillary suckers. However, the differences were not significant.

Table 2: Effect of planting date and chemical desuckering on number and weight of axillary suckers and ground suckers in bidi tobacco varieties.

Treatments	Axillary suckers		Ground suckers	
	Count (suckers/plot)	Weight (kg/plot)	Count (suckers/plot)	Weight (kg/plot)
Varieties (V)				
GT 7 (V ₁)	177.27	0.90	73.05	1.13
GABT11 (V ₂)	146.38	0.72	57.55	0.92
S. Em. ±	5.086	0.031	1.215	0.032
C. D. (P = 0.05)	14.916	0.091	3.563	0.095
Suckericides (S)				
Hand desuckering (S ₁)	296.66	1.47	69.11	1.08
Chemical desuckering (S ₂)	27.00	0.15	61.5	0.97
S. Em. ±	4.152	0.025	0.992	0.026
C. D. (P = 0.05)	12.179	0.074	2.909	0.078
Transplanting date (D)				
3 rd week of August (D ₁)	167.00	0.83	64.16	1.01
1 st week of September (D ₂)	155.16	0.79	64.16	0.99
3 rd week of September (D ₃)	163.33	0.81	67.58	1.08
S. Em. ±	5.086	0.031	1.215	0.032
C. D. (P = 0.05)	NS	NS	NS	NS
Sig. Interactions	S×V	S×V	-	-
CV %	10.9	13.21	6.4	11.0

Conclusion

The results indicated that the varieties, suckericide treatments and transplanting dates played an effective role in vegetative

growth, development and yield attributing characters as well as quality of bidi tobacco. Variety GABT 11 was found superior for most of the growth and physiological parameters

and there by cured leaf yield as compared to variety GT 7. The application of chemical suckericide pendimethalin @ 0.45 % + urea 2 % was found most efficient for the control of auxiliary as well as ground suckers and improving the morpho- physiological parameters and thereby, increased the cured leaf yield without impairing the quality of the produce. On the basis of research finding, it can be concluded that variety GABT 11 should be transplanted in 1st week of September and chemically desuckered with pendimethalin @ 0.45 % + urea 2 % for obtaining higher yield over hand desuckering in bidi tobacco crop.

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