



P-ISSN: 2349-8528

E-ISSN: 2321-4902

IJCS 2018; 6(3): 2451-2454

© 2018 IJCS

Received: 01-03-2018

Accepted: 05-04-2018

SN Tadvi

Department of Plant Physiology,
B. A. College of Agriculture,
Anand Agricultural University,
Anand, Gujarat, India

VB Garasiya

Department of Plant Physiology,
B. A. College of Agriculture,
Anand Agricultural University,
Anand, Gujarat, India

RS Bhadane

Department of Plant Physiology,
B. A. College of Agriculture,
Anand Agricultural University,
Anand, Gujarat, India

MZ Malek

Department of Plant Physiology,
B. A. College of Agriculture,
Anand Agricultural University,
Anand, Gujarat, India

JC Chavda

Bidi Tobacco Research Station,
Anand, Agricultural University,
Anand, Gujarat, India

Correspondence

RS Bhadane

Department of Plant Physiology,
B. A. College of Agriculture,
Anand Agricultural University,
Anand, Gujarat, India

Effect of planting date and chemical desuckering on morpho-physiological parameters and yield of *Rustica* tobacco (*Nicotiana rustica* L.)

SN Tadvi, VB Garasiya, RS Bhadane, MZ Malek and JC Chavda

Abstract

The present investigation on “Effect of planting date and chemical desuckering on morpho-physiological parameters and yield of *rustica* tobacco (*Nicotiana rustica* L.)” was carried out at Bidi Tobacco Research Station, Anand Agricultural University, Anand, during the year 2017-18. The field experiment was laid out in Factorial Randomized Block Design (FRBD) with three replications comprising twelve treatment combinations of two varieties (GC 1 and DCT 4), two suckericides treatments (hand desuckering and pendimethalin @ 0.60 % + 2 % urea and three transplanting dates (4th week of October, 2nd week of November and 4th week of November). On the basis of research finding, it was observed that variety DCT 4 should be transplanted in 4th week of October and chemically desuckered with pendimethalin @ 0.60%+ urea 2% for obtaining higher yield over hand desuckering in *rustica* tobacco crop.

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. India is one of the principal tobacco producing countries in the world. The crop occupies less than 0.24 per cent of the net cultivated area and earns sizable amount of foreign exchange (6424 crores), central excise and state tax including VAT, entry tax etc. (34000 crores) to the nation besides providing direct and indirect employment to 45.7 million people including 6 million farmers and 39.7 million workers (Anon., 2018) [3].

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 *rustica* tobacco can help to increase the production and productivity of *rustica* tobacco.

The transplanting date and varieties had significant effect on the growth and the cured leaf yield in *rustica* tobacco crop due to favourable environment at different growth stages enhance the photosynthetic rate and diversified the assimilates for growth and development of plants. These variances affect the plant growth, development, yield and quality of the tobacco produce. Now a day, the changes in the environment needs to study the date of transplanting on different varieties of *rustica* tobacco. Genetic constitutions and environmental factors affect the production of *rustica* tobacco, as in other cultivated crops. Selection of varieties with faster rate of leaf development (rapid canopy closure) would enable maximum earlier interception of light energy, photosynthesis, biomass production and dry matter accumulation. The physiological response of plant to topping is a result of removing the apical dominance over meristematic growth, this leads to the development of sucker growth from leaf axils. In *rustica* tobacco suckers are developed from the leaf axil and it increased just before or after topping of plants. These unwanted suckers compete with main leaf for food, light, moisture and space. Therefore, control of suckers in tobacco is important for increasing yield and improving quality of the produce. In *rustica* tobacco, due to its high requirements of nitrogen fertilizers, the desuckering problem is more acute.

Materials and Methods

The present investigation entitled "Effect of planting date and chemical desuckering on morpho-physiological parameters and yield of *rustica* tobacco varieties (*Nicotiana rustica* L.)" was carried out at Bidi Tobacco Research Station, Anand Agricultural University, Anand (Gujarat) during the year 2017-18. The field experiment was laid out in Factorial

Randomized Block Design (FRBD) with three replications comprising twelve treatment combinations of two varieties (GC 1 and DCT 4), two suckericides treatments (hand desuckering and pendimethalin @ 0.60 % + 2 % urea and three transplanting date (4th week of October, 2nd week of November and 4th week of November).

Treatment combinations

S. No.	Treatment combinations	Treatments
T ₁	GC 1 + Hand desuckering + 4 th week of October planting	(V ₁ S ₁ D ₁)
T ₂	GC 1 + Hand desuckering + 2 nd week of November planting	(V ₁ S ₁ D ₂)
T ₃	GC 1 + Hand desuckering + 4 th week of November planting	(V ₁ S ₁ D ₃)
T ₄	GC 1 + Pendimethalin @ 0.60 % + 2 % Urea + 4 th week of October planting	(V ₁ S ₂ D ₁)
T ₅	GC 1 + Pendimethalin @ 0.60 % + 2 % Urea + 2 nd week of November planting	(V ₁ S ₂ D ₂)
T ₆	GC 1 + Pendimethalin @ 0.60 % + 2 % Urea + 4 th week of November planting	(V ₁ S ₂ D ₃)
T ₇	DCT 4 + Hand desuckering + 4 th week of October planting	(V ₂ S ₁ D ₁)
T ₈	DCT 4 + Hand desuckering + 2 nd week of November planting	(V ₂ S ₁ D ₂)
T ₉	DCT 4 + Hand desuckering + 4 th week of November planting	(V ₂ S ₁ D ₃)
T ₁₀	DCT 4 + Pendimethalin @ 0.60 % + 2 % Urea + 4 th week of October planting	(V ₂ S ₂ D ₁)
T ₁₁	DCT 4 + Pendimethalin @ 0.60 % + 2 % Urea + 2 nd week of November planting	(V ₂ S ₂ D ₂)
T ₁₂	DCT 4 + Pendimethalin @ 0.60 % + 2 % Urea + 4 th week of November planting	(V ₂ S ₂ D ₃)

Suckericide treatments

The *rustica* 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.

Hand desuckering

Suckers were removed by hand from the axil/base of the leaves just after topping.

Chemical desuckering

To avoid time consuming, laborious and more expensive process of hand desuckering, chemical desuckering was done. Chemical suckericide Pendimethalin @ 0.60% + 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) [9].

Number and weight of suckers

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

Result and Discussion

The plant height of *rustica* 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 DCT 4 (42.39 cm) at harvest. The varietal differences in plant height might be due to genetically efficient character of the variety. Plant height was significantly highest in 4th week of November (D₁) (45.26 cm)

at harvest. This might be due to good day length and favourable climatic conditions received during transplanting date (D₁). These findings were in accordance with the work of Chavda (1998) [4], Patidar (2007) [11] and Dave (2012) [6] in *rustica* tobacco and Syed *et al.* (2008) [17] 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 (40.65 cm) at harvest. Similar results were also observed by Anon. (2003) [1] and Patel *et al.* (2004) [9] in *bidi* tobacco. The leaf area per plant at harvest recorded significantly highest in the variety DCT 4 (1.071 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) [4] and Shamal (2012) [13] in *bidi* tobacco. The suckericide treatment Pendimethalin @ 0.60% + 2% Urea recorded significantly highest leaf area per plant (1.001 m²) at harvest. 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) [15] in chewing tobacco and Jehan *et al.* (2007) [8] in FCV tobacco. Leaf area per plant was significantly highest in the transplanting date D₁ (1.21 m) at harvest. These findings were similar to the previous results given by Anon. (2003) [1] and Patel *et al.* (2004) [9] in *bidi* tobacco. The results regarding specific leaf weight (SLW) indicated significant difference among *rustica* tobacco varieties, while suckericide levels, planting date showed non-significant difference. The SLW represents leaf thickness which indicates better quality of leaf. The variety DCT 4 recorded significantly highest SLW (9.38 mg/m²) at harvesting stage. These results are in accordance with the results obtained by Garasiya *et al.* (2018) [7]. The variety DCT 4 gave significantly highest cured leaf yield (2435 kg/ha) as compared to GC 1 (2026 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 accordance with Syed *et al.* (2008) [17], Syed *et al.* (2009) [16] and Patel (2013) [10] in *Nicotiana tabacum* varieties. Chemical suckericide treatment

pendimethalin @ 0.60% + 2% urea significantly increased the cured leaf yield (2370 kg/ha). Chemical suckericide treatments produced higher total dry matter of leaf due to suppression of axillary suckers, produced photosynthates transferred to vegetative plant parts mostly in the leaves, higher leaf length and breadth and thereby leaf area as well as thickness of leaves. Chavda *et al.* (2007) [5] found that application of pendimethalin @ 0.60% + 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) [9] and Jehan *et al.* (2007) [8] in *Nicotiana tabacum*. The transplanting date D₁ (4th week of October) recorded significantly highest cured leaf yield (2860 kg/ha) as compared to D₂ (2nd week of November 2127 kg/ha) and D₃ (4th week of November 1705 kg/ha). These results are in accordance with the results obtained by

Garasiya *et al.* (2018) [7]. The variety DCT 4 had significantly highest number and weight of suckers (57.00 and 0.981 kg/plot, respectively) as compared to variety GC 1 (51.16 and 0.843 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 suckers (8.66 and 0.151 kg/plot, respectively). Contact type suckericide Pendimethalin was used to prevent the sucker growth which appears to desiccate tender sucker tissue by dissolving the cuticular layer. Thompson, (2001) [18] 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) [1], Patel *et al.* (2004) [9] in *bidi* tobacco and Jehan *et al.* (2007) [8] in FCV tobacco.

Table 1: Effect of planting date and chemical desuckering on plant height, leaf area per plant, cured leaf yield, number and weight of suckers at harvesting stage in *rustica* tobacco varieties.

Treatments	Plant height (cm)	Leaf area / plant (m ²)	specific leaf weight (mg/m ²)	Cured leaf yield (kg/ha)	Suckers	
					Count (suckers/plot)	Weight (kg/plot)
Varieties (V)						
GC-1 (V ₁)	39.37	0.842	8.00	2026	51.16	0.843
DCT-4 (V ₂)	42.39	1.071	9.38	2435	57.00	0.981
SEm. ±	0.976	2.01	0.191	49.49	1.47	2.76
CD at 5%	2.865	5.91	0.560	145	4.33	8.11
Suckericides (S)						
Hand desuckering (S ₁)	40.11	0.913	8.66	2091	99.50	1.673
Chemical desuckering (S ₂)	40.65	1.001	8.72	2370	8.66	0.151
SEm. ±	0.976	2.01	0.191	49.49	1.47	2.76
CD at 5%	NS	5.91	NS	145	4.33	8.11
Transplanting date (D)						
4 th week of October (D ₁)	45.26	1.21	9.35	2860	68.25	1.172
2 nd week of November (D ₂)	40.62	0.925	8.67	2127	52.75	0.894
4 th week of November (D ₃)	36.73	0.736	7.88	1705	41.25	0.67
SEm. ±	1.19	2.47	0.234	60.61	1.81	3.38
CD at 5%	3.50	7.24	0.686	177	5.30	9.94
Sign. Interactions	-	-	-	-	S x D	S x D
C.V. %	10.1	8.0	9.3	9.41	11.6	12.9

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 *rustica* tobacco. Variety DCT 4 was found superior for most of the growth and physiological parameters and there by cured leaf yield as compared to variety GC 1. The application of chemical suckericide pendimethalin @ 0.60 % + urea 2 % was found most efficient for the control of 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 DCT 4 should be transplanted in 4th week of October and chemically desuckered with pendimethalin @ 0.60% + urea 2% for obtaining higher yield over hand desuckering in *rustica* tobacco crop.

References

1. Anonymous. Annual report of 16th meeting of plant physiology and biochemistry sub-committee of agriculture research council, Anand, 2003.
2. Anonymous. AINRP (Tobacco), XXI Tobacco workshop, June 2013, Central Tobacco Research Institute, Rajahmundry, Andhra Pradesh, 2013.
3. Anonymous. The Tobacco Institute of India, New Delhi.- Fact sheets. Retrieved from www.tiionline.org, 2018.
4. Chavda JC. Physiological basis of heteriosis in *bidi* tobacco (*Nicotiana tabacum* L.). Ph.D. thesis submitted to Gujarat Agricultural University, Anand, 1998.
5. Chavda JC, Parmar DJ, Patel BK). Sucker management in *bidi* tobacco varieties as influenced by stage and level of topping. *Tob. Res.*, 2007, 33(1&2):43-45.
6. Dave VD. Heterosis and combining ability analysis in *bidi* tobacco (*Nicotiana tabacum* L.). M.Sc. Thesis submitted to Anand Agricultural University, Anand, 2012.
7. Garasiya VB, Tadvi SN, Bhadane RS, Chavda JC. Influence of planting date and chemical desuckering on morpho-physiological parameters, yield and quality of *bidi* tobacco varieties (*Nicotiana Tabacum* L.). *International Journal of Chemical Studies*. 2018; 6(2):91-94.
8. Jehan Bhakt, Shad Khan, Khalil, Mohammad Shafi, Attar-Rehman, Sohail Akhter M, Ismail Jan. Comparative effect of suckericides and manual desuckering on the yield and quality of FCV tobacco. *Sarhad J. Agric.* 2007; 23(1):11-15.

9. Patel BK, Chavda JC, Parmar DJ. Sucker management in *bidi* tobacco (*Nicotiana tabacum* L.). Tob. Res. 2004; 30(2):157-159.
10. Patel DC. Heteriosis and combining ability analysis in tobacco (*Nicotiana rustica* L.) M.sc. Thesis submitted to Anand Agricultural University, Anand, 2013.
11. Patidar A. Diallel analysis for yield, its components and quality traits in *bidi* tobacco (*Nicotiana tabacum* L.). M. Sc. Thesis submitted to Anand Agricultural University, Anand, 2007.
12. Shah DN. Yield, chemical composition and smoke constituents of *bidi* tobacco as affected by topping stage. M. Sc. Thesis submitted to Gujarat Agricultural University, Anand, 1993.
13. Shamal AR. Heteriosis and combining ability analysis of important qualitative characters in *bidi* tobacco (*Nicotiana tabacum* L.). M. Sc. Thesis submitted to Anand Agricultural University, Anand, 2012.
14. Singh AK. *Tobacco*. Satish serial publishing house, New Delhi, 2010, 36-37.
15. Singh KD, Tripathi SN, Pandey AK. Effect of sucker control methods on yield, quality and economics of chewing tobacco under North Bihar condition. Tob. Res. 1999; 25(1):18-22.
16. Syed Mehar Ali Shah, Farhatullah, Hidayat-ur-rahman, Attaullah, Durrishahwar M, Yasir Khan et al. Acclimatization of burley tobacco germplasm under agro-climatic conditions of swat valley. Sarhad J. Agric. 2009; 25(1):31-36.
17. Syed MAS, Ashfaq A, Fida M, Hidayad-ur-Rehaman, Gul W, Mohammad YK et al. Genotypic evolution of some flue cured Virginia tobacco genotypes for yield and quality traits. Sarhad J. Agric. 2008; 24(4):607-611.
18. Thompson L. Efficacy of sucker control method and effect of topping height on axillary bud growth in dark fire-cured tobacco. Master's thesis and specialist projects, 2001, 640.