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ORIGINAL ARTICLE

Estimation of loss and analysis of nicotine, reducing sugar and chloride in bidi tobacco due to reniform nematode under pot conditions

Aarti Bairwa · H. R. Patel

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Abstract Estimation of avoidable loss in yield of bidi tobacco due to reniform nematode under pot conditions revealed that variety A 119 suffered heavily than ABT 10 due to reniform nematode. Inoculation of reniform nematode @ 2000 J_4 per plant significantly reduced the plant growth characters and increased nematode multiplication preferring A 119 variety. Estimation of avoidable loss in cured shoot yield of bidi tobacco due to infection of reniform nematode in individual variety ABT 10 and A 119 has been estimated to the tune of 30.5 and 34.2 per cent with overall loss 31.9 per cent in both the variety 60 DAI. Simply growing of ABT 10 variety irrespective of infection of reniform nematode avoided 29.5 per cent loss in cured shoot yield. ABT 10 recorded significantly high nicotine, reducing sugar and chloride than A 119; inoculation of reniform nematode significantly increased nicotine, reducing sugar and chloride compared to no inoculation. Interaction indicated that inoculation of 2000 J_4 of reniform nematode significantly increased nicotine, reducing sugar and chloride in A 119 compared to no inoculation; while significantly reduced reducing sugar and increased chloride in ABT 10. There was no significant impact of infection of reniform nematode on nicotine in ABT 10.

Keywords Loss · Bidi tobacco · *Rotylenchulus reniformis* · Nicotine · Reducing sugar · Chloride

A. Bairwa (✉)
CPRI, Shimla, Himachal pradesh, India
e-mail: avaartiverma20@gmail.com

A. Bairwa · H. R. Patel
Bidi Tobacco Research Station, AAU, Anand 388110, India
e-mail: drhrpatel10@gmail.com

Tobacco (*Nicotiana tabacum* L.), an important non-food narcotic cash crop, occupies less than 0.27 per cent of the net cultivated area and earns sizable amount of foreign exchange (Rs. 4,210 crores), central excise (Rs. 14,000 crores) to the national exchequer and VAT (Rs. 5,000 crores) besides providing direct and indirect employment to 36 million people including 6 million farmers and workers (Krishnamurthy 2011). Plant parasitic nematodes cause severe damage to the crop. Root-knot (*Meloidogyne incognita*; *M. javanica),* reniform (*Rotylenchulus reniformis*) and stunt (*Tylenchorhynchusvulgaris*) nematodes are found predominantly attacking bidi tobacco in Gujarat. Worldwide loss in tobacco yield due to them was estimated to the tune of 14.7 per cent (Sasser and Freckman 1987). Estimation of losses in production of transplants and cured leaf yield of bidi tobacco due to root-knot nematodes revealed 51 and 31 to 50 per cent loss, respectively (Shah et al. 1983; Markose and Patel 1977; Patel et al. 1986). Patel et al. (2002) reported avoidable loss to the tune of 33 per cent in root-knot susceptible bidi tobacco cultivar Anand 119 (A 119) and up to 23 per cent in tolerant variety Gujarat Tobacco (GT 5) due to stunt, root-knot and reniform nematodes. Patel and Patel (2009) estimated 22.1 per cent avoidable loss due to infection of reniform nematode at first pulling and overall loss to the tune of 5.51 per cent in production of transplants in bidi tobacco nursery. Avoidable loss due to stunt nematodes in bidi tobacco nursery has been estimated to the tune of 14 per cent in production of transplants (Patel and Joshi 2011). In present investigation, attempts were made to estimate avoidable loss in quantity and quality of root-knot resistant and susceptible bidi tobacco cv. ABT 10 and A 119, respectively against reniform nematode (Fig. 1).

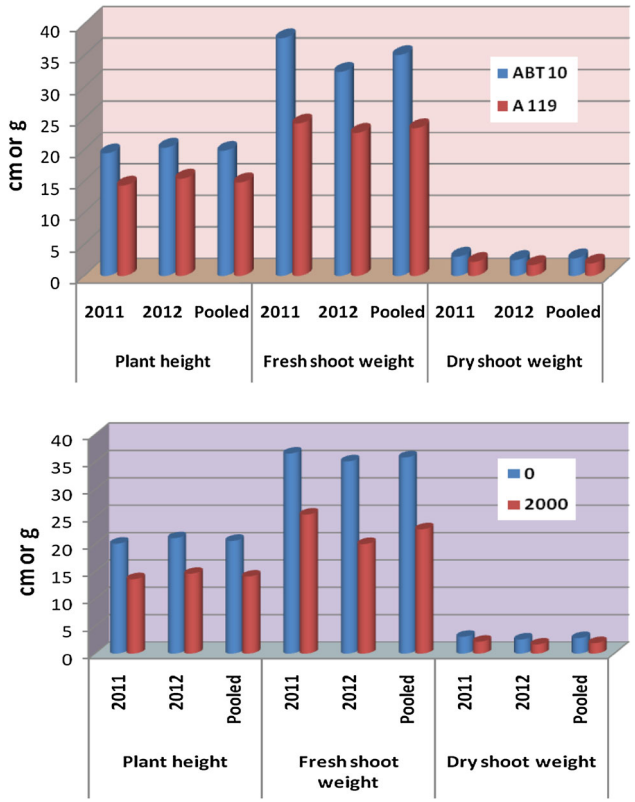

Fig. 1 Effect of reniform nematode on loss in bidi tobacco: shoot growth

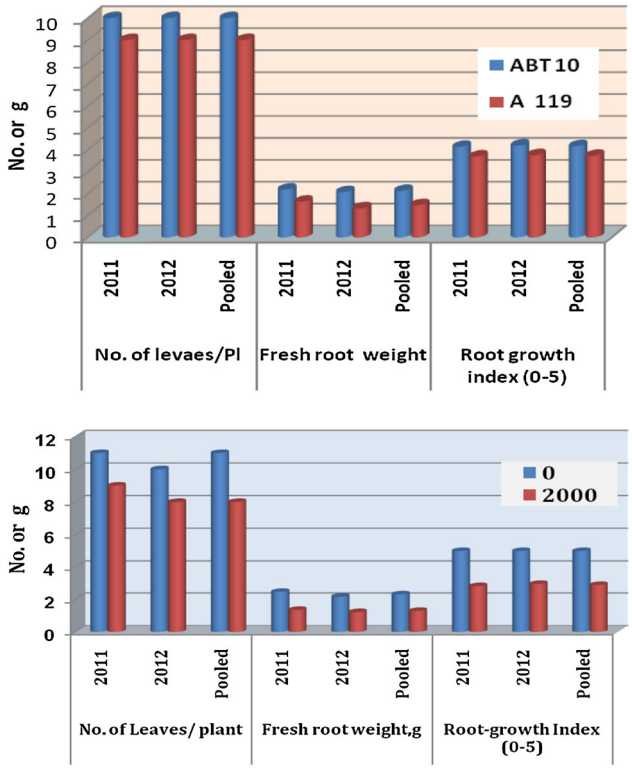

Fig. 2 Effect of reniform nematode on loss in bidi tobacco: number of leaves & root growth

Materials and methods

An experiment was conducted, during the year 2011 and 2012, to estimate avoidable loss in yield of bidi tobacco due to reniform nematode under pot conditions on root-knot resistant and susceptible bidi tobacco. There were four treatments comprising of two varieties viz. ABT 10 (V_1), and A 119 (V_2) and two inoculum levels viz. 0 {Control (I_1)} and 2000 J_4 (I_2) per pot. Each treatment was repeated eight times in Completely Randomized Design. Thus, thirty-two disinfested pots of 15 cm diameter were filled with 500 cc sterilized soil and FYM. Each pot was transplanted with healthy seedling of bidi tobacco according to treatments keeping one seedling per pot. Second stage juveniles (J_2) of reniform nematode were extracted from well mixed soil collected from the pure culture micro plot using Petri dish Assembly Method (Chawla and Prasad 1974). After 24 h, nematode suspension was carefully collected, concentrated and kept for 15 days at room temperature till juveniles convert into pre-adult stages (J_4). The nematode count (pre-adult female) per ml in water suspension was estimated using stereoscopic binocular microscope for inoculation purpose. Required quantity (20 ml) of nematode suspension was inoculated per pot as per the treatment in the respective pot, while in control only 20 ml water without nematode was poured. The pots were kept on the bench in net house. The seedlings were watered regularly and protected from the insect damage using appropriate management measures. All agronomic practices in vogue were followed. Observations on plant growth, nematode penetration in stained roots (Franklin, 1949) and multiplication were recorded 60 days after inoculation (60 DAI) (Fig. 2).

Additional set of the experiment as above was also simultaneously maintained to meet the requirements of cured (dry) leaves of bidi tobacco cv. ABT 10 and A 119 for quality analysis. Cured leaves of respective treatments were pulverized to make fine powder. Required quantity of the cured leaf powder from respective treatments were weighed and analyzed, keeping four repetitions, for each treatment following standard method for nicotine and reducing sugar (Harvey et al. 1969) as well as chloride (Murthy et al. 1962) at the Agril. Chemistry and Soil Science Section, BTRS, AAU, Anand. Finally, the data were tabulated and analyzed consulting the statistician at Department of Agricultural Statistics, BACA, AAU, Anand.

Results and discussion

Perusal of data presented in Tables 1, 2 and 3 revealed significant differences for variety (V), inoculum level

(I) and interaction V × I in individual years and in pooled analysis for plant growth characters viz., plant height, shoot weight, number of leaves per plant, root weight and growth index barring shoot weight in pooled and fresh shoot weight and number of leaves in 2012 for V × I; while root weight in both the years and in pooled analysis for V × I.

Significant difference in all characters of nematode multiplication (Tables 4, 5, 6) was observed for inoculum level (I) in individual years and in pooled results, while it was significant for number of egg mass per plant in variety (V) and interaction V × I; only in pooled results of variety and interaction V × I in case of number of females per plant, soil and final population. Year effect was significant for shoot and root weight as well as number of leaves per plant. Interactions, Y × V, Y × I and Y × V × I, were significant for fresh shoot weight; while Y × V × I only for dry shoot weight (Fig. 3).

Root-knot resistant ABT 10 was significantly superior to root-knot susceptible A 119 in all plant growth characters avoiding loss of 29.5 per cent in cured shoot yield with significantly reduced nematode multiplication in pooled results barring number of eggs per egg mass with a rate of reproduction 2.7.

Inoculation of 2000 J_4 of reniform nematode (I_2) per plant significantly reduced all plant growth characters causing loss of 31.9 per cent in cured shoot yield with increased multiplication with a rate of reproduction 3.1 than no inoculation (I_1). Significantly higher multiplication of reniform nematode was observed in A 119 than ABT 10 with a rate of reproduction 3.5 and 2.7, respectively. The loss in cured shoot yield in individual bidi tobacco ABT 10 and A 119 was estimated to the tune of 30.5 and 34.2 per cent (Fig. 4).

Analysis of nicotine, reducing sugar and chloride (Table 7) revealed significant difference in variety (V), inoculum level (I) and interaction V × I.

The results revealed that ABT 10 (V_1) recorded significantly higher nicotine, reducing sugar and chloride

Table 1 Estimation of loss in yield of bidi tobacco due to reniform nematode under pot conditions: effect on plant height (cm) and Fresh Shoot weight, g

Treatment	Plant height, cm			Fresh shoot weight, g		
	2011	2012	Pooled	2011	2012	Pooled
Variety (V)						
ABT 10 (V_1)	19.4	20.3	19.8	37.74	32.42	35.08
A 119 (V_2)	14.3	15.4	14.8	24.22	22.75	23.48
S.Em.±	0.6	0.7	0.4	0.63	0.97	1.22
CD 0.05	1.6	2.0	1.3	1.85	2.82	21.91
S.Em.± (Y × V)	0.6			0.82		
CD 0.05 (Y × V)	NS			2.31		
Inoculum level J_4(I)						
0 J_4 (I_1)	20.1	21.1	20.6	36.55	35.13	35.84
2000 J_4 (I_2)	13.6	14.6	14.1	25.40	20.03	22.72
S.Em.±	0.6	0.7	0.4	0.63	0.97	1.98
CD 0.05	1.6	2.0	1.3	1.85	2.82	7.76
V × I						
V_1I_1	21.6	22.2	21.9	41.19	41.07	–
V_1I_2	17.1	18.2	17.7	34.28	23.76	–
V_2I_1	18.6	19.8	19.3	31.9	29.19	–
V_2I_2	10.0	11.0	10.5	16.52	16.31	–
S.Em.±	0.79	0.98	0.62	0.90	1.37	0.82
CD 0.05	2.30	2.87	1.77	2.62	NS	NS
Year	NS			Sign.		
S.E.± (Y × I)	0.6			0.82		
CD 0.05 (Y × I)	NS			3.21		
S.E.± (Y × V × I)	0.9			1.16		
CD 0.05 (Y × V × I)	NS			3.27		
CV %	13.2	15.6	14.5	8.1	14.0	11.1

Table 2 Estimation of loss in yield of bidi tobacco due to reniform nematode under pot conditions: effect on dry shoot weight (g)

Treatment	Dry shoot weight, g			Per cent avoidable loss
	2011	2012	Pooled	
Variety (V)				
ABT 10 (V_1)	3.04	2.52	2.78	29.5
A 119 (V_2)	2.21	1.71	1.96	
S.Em.±	0.08	0.06	0.05	
CD 0.05	0.23	0.17	0.14	
S.Em. ± (Y × V)	0.07			
CD 0.05 (Y × V)	NS			
Inoculum level J_4(I)				
0 J_4 (I_1)	3.07	2.57	2.82	31.9
2000 J_4 (I_2)	2.17	1.66	1.92	
S.Em.±	0.08	0.06	0.05	
CD 0.05	0.23	0.17	0.14	
V × I				
V_1I_1	3.66	2.89	–	30.5
V_1I_2	2.41	2.15	–	
V_2I_1	2.49	2.25	–	34.2
V_2I_2	1.93	1.18	–	
S.Em.±	0.11	0.08	0.07	
CD 0.05	0.33	0.24	NS	
Year	Sign.			
S.Em.± (Y × I)	0.07			
CD 0.05 (Y × I)	NS			
S.Em.± (Y × V × I)	0.10			
CD 0.05 (Y × V × I)	0.28			
CV %	12.3	12.3	12.3	

Table 3 Estimation of loss in yield of bidi tobacco due to reniform nematode under pot conditions: effect on number of leaves/plant, fresh root weight (g) and root growth

Treatment	No. of leaves/plant			Fresh root weight, g			Root growth Index (0–5)*		
	2011	2012	Pooled	2011	2012	Pooled	2011	2012	Pooled
Variety (V)									
ABT10 (V_1)	10	10	10	2.18	2.06	2.12	4.13	4.19	4.16
A119 (V_2)	9	9	9	1.63	1.32	1.47	3.69	3.75	3.72
S.E.±	0.16	0.15	0.11	0.07	0.05	0.04	0.09	0.09	0.06
CD 0.05	0.47	0.43	0.31	0.19	0.15	0.12	0.25	0.27	0.18
S.E. ± (Y × V)	0.15			0.06			0.09		
CD0.05 (Y × V)	NS			NS			NS		
Inoculum level J_4 (I)									
0 J_4 (I_1)	11	10	11	2.46	2.16	2.31	5.00	5.00	5.00
2000 J_4 (I_2)	9	8	8	1.35	1.22	1.29	2.81	2.94	2.88
S.E.±	0.16	0.15	0.11	0.07	0.05	0.04	0.09	0.09	0.06
CD 0.05	0.47	0.43	0.31	0.19	0.15	0.12	0.25	0.27	0.18
V × I									
V_1I_1	11	–	11	–	–	–	5.00	5.00	5.00
V_1I_2	9	–	9	–	–	–	3.25	3.38	3.31
V_2I_1	11	–	9	–	–	–	5.00	5.00	5.00
V_2I_2	8	–	8	–	–	–	2.38	2.50	2.44
S.E.±	0.23	0.21	0.16	0.09	0.07	0.06	0.12	0.13	0.09
CD 0.05	0.67	NS	0.48	NS	NS	NS	0.36	0.38	0.25
Year	Sign.			Sign.			NS		
S.E. ± (Y × I)	0.15			0.06			0.09		
CD0.05 (Y × I)	NS			NS			NS		
S.E.± (Y × V × I)	0.22			0.08			0.13		
CD 0.05 (Y × V × I)	NS			NS			NS		
CV %	6.6	6.3	6.5	13.9	12.3	13.2	8.9	9.4	9.1

* *0* Minimum root growth, *5* maximum root growth

Table 4 Estimation of loss in yield of bidi tobacco due to reniform nematode under pot conditions: effect on number of eggs/egg mass and egg mass/plant

Treatment	No. of eggs/egg mass ($\sqrt{x}$ + 1 trans.)			No. of egg mass/plant ($\sqrt{x}$ + 1 trans.)		
	2011	2012	Pooled	2011	2012	Pooled
Variety (V)						
ABT10 (V_1)	3.80 (21)	3.84 (21)	3.82 (21)	5.35 (47)	5.08 (42)	5.21 (44)
A119 (V_2)	3.98 (24)	4.02 (24)	4.00 (24)	6.08 (62)	5.96 (60)	6.02 (61)
S.Em.±	0.12	0.13	0.09	0.17	0.18	0.13
CD 0.05	NS	NS	NS	NS	0.54	0.36
S.Em.± (Y × V)	0.13			0.18		
CD 0.05 (Y × V)	NS			NS		
Inoculum level J_4 (I)						
0 J_4 (I_1)	1.00 (0)	1.00 (0)	1.00 (0)	1.00 (0)	1.00 (0)	1.00 (0)
2000 J_4 (I_2)	6.77 (45)	6.96 (45)	6.82 (45)	10.43 (109)	10.04 (101)	10.23 (105)
S.Em.±	0.12	0.13	0.09	0.17	0.18	0.13
CD 0.05	0.35	0.38	0.25	0.50	0.54	0.36
V × I						
V_1I_1	–	–	–	1.00 (0)	1.00 (0)	1.00 (0)

Table 4 continued

Treatment	No. of eggs/egg mass ($\sqrt{x}$ + 1 trans.)			No. of egg mass/plant ($\sqrt{x}$ + 1 trans.)		
	2011	2012	Pooled	2011	2012	Pooled
V_1I_2	–	–	–	9.70 (94)	9.16 (83)	9.43 (89)
V_2I_1	–	–	–	1.00 (0)	1.00 (0)	1.00 (0)
V_2I_2	–	–	–	11.17 (125)	10.92 (120)	11.04 (122)
S.Em.±	0.17	0.19	0.13	0.24	0.26	0.17
CD 0.05	NS	NS	NS	0.71	0.76	0.50
Year	NS			NS		
S.Em.± (Y × I)	0.13			0.18		
CD 0.05 (Y × I)	NS			NS		
S.Em.± (Y × V × I)	0.18			0.25		
CD 0.05 (Y × V × I)	NS			NS		
CV %	12.3	13.4	12.8	12.1	13.3	12.7

Table 5 Estimation of loss in yield of bidi tobacco due to reniform nematode under pot conditions: effect on number of females/plant and soil population

Treatment	No. of females/plant ($\sqrt{x}$ + 1 trans.)			Soil population (500 CC) (Log x + 1 trans.)		
	2011	2012	Pooled	2011	2012	Pooled
Variety (V)						
ABT10 (V_1)	5.95 (59)	5.55 (51)	5.75 (55)	1.86 (2721)	1.85 (2521)	1.86 (2621)
A119 (V_2)	6.35 (69)	6.22 (66)	6.28 (67)	1.92 (3456)	1.90 (3394)	1.91 (3425)
S.E.±	0.16	0.24	0.14	0.02	0.03	0.02
CD 0.05	NS	NS	0.40	NS	NS	0.05
S.E. ± (Y × V)	0.20			0.03		
CD0.05 (Y × V)	NS			NS		
Inoculum level J_4 (I)						
0 J_4 (I_1)	1.00 (0)	1.00 (0)	1.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
2000 J_4 (I_2)	11.30 (128)	10.77 (117)	11.03 (122)	3.78 (6177)	3.75 (5915)	3.77 (6046)
S.E.±	0.16	0.24	0.14	0.03	0.03	0.02
CD 0.05	0.46	0.69	0.40	0.07	0.09	0.05
V × I						
V_1I_1	–	–	1.00 (0)	–	–	0.00 (0)
V_1I_2	–	–	10.50 (110)	–	–	3.70 (5242)
V_2I_1	–	–	1.00 (0)	–	–	0.00 (0)
V_2I_2	–	–	11.57 (134)	–	–	3.81 (6850)
S.E.±	0.22	0.34	0.20	0.04	0.04	0.03
CD 0.05	NS	NS	0.57	NS	NS	0.08
Year	NS			NS		
S.E.± (Y × I)	0.20			0.03		
CD 0.05 (Y × I)	NS			NS		
S.E.± (Y × V × I)	0.29			0.04		
CD 0.05 (Y × V × I)	NS			NS		
CV %	10.3	16.2	13.5	5.4	6.2	5.8

Table 6 Estimation of loss in yield of bidi tobacco due to reniform nematode under pot conditions: effect on final population

Treatment	Final population (Log x + 1 trans.)			Rr = Pf/Pi
	2011	2012	Pooled	
Variety (V)				
ABT10 (V_1)	1.86 (2780)	1.85 (2572)	1.86 (2676)	2.7
A119 (V_2)	1.92 (3525)	1.90 (3460)	1.91 (3493)	3.5
S.Em.±	0.02	0.03	0.02	
CD 0.05	NS	NS	0.05	
S.Em. ± (Y × V)	0.03			
CD0.05 (Y × V)	NS			
Inoculum level J_4 (I)				
0 J_4 (I_1)	0.00 (0)	0.00 (0)	0.00 (0)	0.0
2000 J_4 (I_2)	3.78 (6305)	3.75 (6032)	3.77 (6169)	3.1
S.Em.±	0.02	0.03	0.02	
CD 0.05	0.07	0.08	0.05	
V × I				
V_1I_1	–	–	0.00 (0)	0.0
V_1I_2	–	–	3.71 (5352)	2.7
V_2I_1	–	–	0.00 (0)	0.0
V_2I_2	–	–	3.82 (6985)	3.5
S.Em.±	0.04	0.04	0.03	
CD 0.05	NS	NS	0.08	
Year	NS			
S.Em.± (Y × I)	0.03			
CD 0.05 (Y × I)	NS			
S.E. ± (Y × V × I)	0.04			
CD 0.05 (Y × V × I)	NS			
CV %	5.2	6.0	5.6	

compared to A 119 (V_2). Inoculation of 2000 J_4 per plant (I_2) significantly increased nicotine, reducing sugar and chloride than no inoculation (I_1).

In interaction V × I, significant increase in nicotine was observed in nematode inoculated A 119 (V_2I_2) compared to no inoculation (V_2I_1); while it was non-significantly reduced in ABT 10 (V_1I_2 & V_1I_1). Reducing sugar was significantly reduced and increased in inoculated ABT 10 and A 119, respectively than no inoculation; chloride was significantly increased in inoculated ABT 10 (V_1I_2) than no inoculation(V_1I_1), while it was found at par in both inoculated and no inoculated treatments of A 119. Remaining interactions were non-significant barring Y × V for reducing sugar and year effect for reducing sugar and chloride.

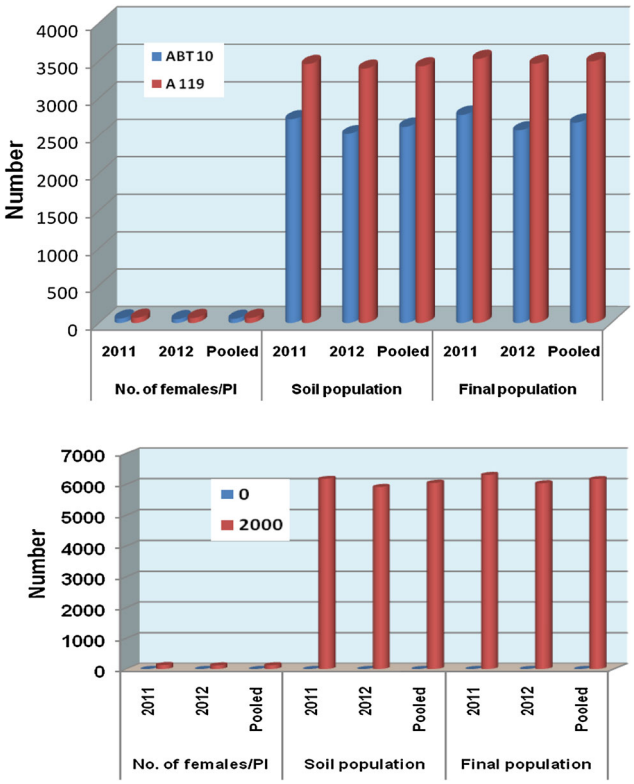

Fig. 3 Effect of reniform nematode on loss in bidi tobacco: nematode multiplication

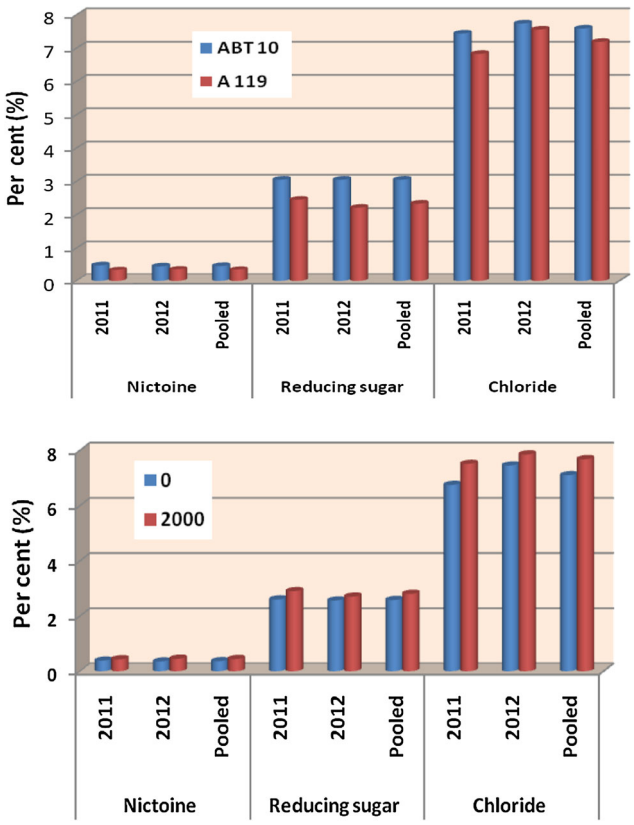

Fig. 4 Effect of reniform nematode on quality of bidi tobacco

Table 7 Effect of infection of reniform nematode on nicotine, reducing sugar and chloride in bidi tobacco

Treatment	Nicotine (%)			Reducing sugar (%)			Chloride (%)		
	2011	2012	Pooled	2011	2012	Pooled	2011	2012	Pooled
Variety (V)									
ABT 10 (V_1)	0.48	0.45	0.46	3.05	3.05	3.05	7.44	7.74	7.59
A 119 (V_2)	0.33	0.35	0.34	2.45	2.21	2.33	6.83	7.56	7.19
S.E.±	0.02	0.02	0.01	0.05	0.04	0.05	0.14	0.08	0.06
CD 0.05	0.06	0.06	0.03	0.14	0.13	0.95	0.42	NS	0.16
S.E.± (Y × V)	0.01			0.03			0.08		
CD 0.05 (Y × V)	NS			0.09			NS		
Inoculum level J_4 (I)									
0 J_4 (I_1)	0.38	0.35	0.36	2.60	2.56	2.58	6.75	7.45	7.10
2000 J_4 (I_2)	0.43	0.45	0.44	2.90	2.70	2.80	7.51	7.85	7.68
S.E.±	0.02	0.02	0.01	0.05	0.04	0.02	0.14	0.08	0.06
CD 0.05	NS	0.06	0.03	0.14	0.13	0.07	0.42	0.22	0.16
V × I									
V_1I_1	0.50	0.45	0.48	3.30	3.30	3.30	6.78	–	7.13
V_1I_2	0.45	0.45	0.45	2.80	2.80	2.80	8.10	–	8.05
V_2I_1	0.25	0.25	0.25	1.90	1.83	1.86	6.73	–	7.08
V_2I_2	0.40	0.45	0.43	3.00	2.60	2.80	6.93	–	7.31
S.E.±	0.03	0.03	0.01	0.07	0.06	0.03	0.20	0.11	0.08
CD 0.05	0.08	0.08	0.04	0.20	0.18	0.09	0.59	NS	0.23
Year	NS			Sign.			Sign.		
S.E.± (Y × I)	0.01			0.03			0.08		
CD 0.05 (Y × I)	NS			NS			NS		
S.E.± (Y × V × I)	0.02			0.05			0.11		
CD0.05 (Y × V × I)	NS			NS			NS		
CV %	14.4	14.4	14.4	4.9	4.7	4.8	5.7	2.8	4.4

The above results revealed that between two varieties, A 119 suffered heavily than ABT 10 with respect to different plant growth characters viz., plant height, fresh and dry shoot, fresh root weight, root growth score studied with higher multiplication of reniform nematode. Infection of the nematode significantly retarded the growth character of bidi tobacco with multiplication rate of 3.1 within 60 DAI.

The interaction V × I was also exhibited the same trend that between two varieties, A 119 suffered heavily than ABT 10 due to reniform nematode. Estimation of avoidable loss in cured shoot yield due to infection of reniform nematode in individual variety ABT 10 and A 119 has been estimated to the tune of 30.5 and 34.2 per cent, respectively with overall loss of 31.9 per cent in both the variety 60 DAI. Simply growing of ABT 10 variety, irrespective of infection of reniform nematode avoided the loss of 29.5 per cent in cured shoot yield. Losses in yield of tomato (Subramaniyan et al. 1989), cotton (Robinson 2001) and in bidi tobacco nursery (Patel and Patel 2009) due to reniform nematode has been estimated. However, it is lacking under field crop of bidi tobacco. No doubt, Patel et al. (2002) have estimated 33 and 23 per cent loss in yield of bidi tobacco under field due to combine infection of root-knot, reniform and stunt nematodes but absolute loss due to reniform nematode in field of bidi tobacco is not available. Our results on estimation of cured yield loss in bidi tobacco under pot conditions are in the agreement with the results obtained on different crops as well as bidi tobacco by the above scientists.

The above results indicated that ABT 10 recorded significantly higher nicotine, reducing sugar and chloride compared to A 119 irrespective of nematode inoculation. Inoculation of reniform nematode significantly increased nicotine, reducing sugar and chloride compared to no inoculation irrespective of variety. However, interaction V × I revealed significant increase in nicotine and reducing sugar in inoculated A 119 compared to its no inoculation treatment. Similarly chloride was also increased in inoculated A 119 but it was not significant compared to its no inoculation. In case of ABT 10, inoculation of the nematode significantly reduced reducing sugar and increased chloride compared to its no

inoculation. Nicotine was reduced in inoculated treatment of ABT 10 than no inoculation but it was not significant. The results reported by scientists working on tobacco (Hanounik and Osborne 1977; Barker and weeks 1981; Ramkrishnayya and Hussaini 1987 and Siva Raju and Krishnamurthy 1996) with root-knot nematodes observed reduced nicotine and sugar content in tobacco leaves due to the infection. In our results, reduction in nicotine and reducing sugar due to infection of reniform nematode was not observed in root-knot susceptible A 119 but it increased may be due to different nematode. The nature of damage caused by root-knot and reniform nematodes are quite different. Roots will be much more disturbed in root-knot infection than the infection of reniform nematode and as a result whatever nicotine synthesized in roots may be translocate and accumulate in the leaves in case of reniform nematode. Secondly, infection of reniform nematode retards the shoot growth and synthesized chemical constituents accumulate in retarded shoot growth giving high percentage of chemicals than flourish shoot growth in no infection. ABT 10 recorded significantly higher nicotine, reducing sugar and chloride compared to A 119, irrespective of nematode inoculation, because of its potential as mentioned by Patel and Patel (2010).

Thus it concluded that A 119 suffered heavily than ABT 10 with respect to reduction in different plant growth characters with higher multiplication of reniform nematode with a rate of reproduction 3.1 within 60 DAI. Estimation of avoidable loss in cured shoot yield due to infection of reniform nematode in individual variety ABT 10 and A 119 has been estimated to the tune of 30.5 and 34.2 per cent, respectively with overall loss of 31.9 per cent in both the variety 60 DAI. Simply growing of ABT 10 variety, irrespective of infection of reniform nematode avoided the loss of 29.5 per cent in cured shoot yield.

ABT 10 recorded significantly higher nicotine, reducing sugar and chloride compared to A 119 irrespective of nematode inoculation. Inoculation reniform nematode significantly increased nicotine, reducing sugar and chloride compared to no inoculation irrespective of variety. However, interaction revealed significant increase in nicotine and reducing sugar in the nematode inoculated A 119 compared to its no inoculation treatment. Similarly chloride was also increased in the nematode inoculated A 119 but it was not significant. In case of ABT 10, inoculation of the nematode significantly reduced reducing sugar and increased chloride compared to its no inoculation. Nicotine was reduced in the nematode inoculated ABT 10 but it was not significant.

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