

IMPACT OF ROTATION WITH RESISTANT VARIETY FOR THE MANAGEMENT OF ROOT-KNOT NEMATODE IN *BIDI* TOBACCO FIELD

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An experiment was conducted for six years (2017-18 to 2022-23) at Bidi Tobacco Research Station, Anand Agricultural University, in randomized block design with an objective to find out a minimum of rotation resistant to minimize root knot disease in susceptible variety. six consecutive years, A 119, a susceptible variety is planted after one, two, three and four year rotation with a resistant variety ABT 10. The results revealed that a significant difference among the treatments for yield and root-knot index was observed. Four years of rotation in field of which first, second, third and four years were transplanted with a resistant variety ABT 10 followed by susceptible variety A 119 yielded significantly superior cured leaf yield 1548, 1790, 1825, 1604 kg/ha, respectively. A susceptible variety A 119 transplanted continuously yielded statistically lower cured leaf yield 1188 kg/ha. Maximum index (4.70) of root-knot was registered in a plot where susceptible variety A 119 grown continuously.

INTRODUCTION

The root-knot nematodes are one of the major biotic stresses in tobacco cultivation. The extent of damage in tobacco yield loss is often reported to be 33 and 23 per cent loss in yield of bidi tobacco under field due to combined infection of root-knot, reniform and stunt nematodes (Patel *et al.*, 2002). Control of Plant-parasitic nematodes has been mainly based on chemical nematicides. Nonetheless, the number of active substances available has been progressively decreased due to their harmful effects on the environment and human and animal health (Sorribas *et al.*, 2020). In addition, the use of nematicides has been limited to strictly necessary circumstances in the application of the European Directive 2009/128/

EC, for the sustainable use of pesticides. Consequently, nematode management should combine durable and sustainable control methods, prioritising the natural regulatory elements to maintain nematode densities below the economic damage thresholds in an integrated pest management framework. plant resistance and agronomic practices are fundamental tools for nematode management. The genetic resistance is an effective and economically cost-effective technique against *M. arenaria*, *M. incognita* and *M. javanica* (Sorribas *et al.*, 2005). Its use reduces the nematode population growth rate and the equilibrium density (Talavera *et al.*, 2009; Gine and Sorribas, 2017a), resulting in a lower soil infestation at the end of the crop and significantly reducing the yield losses in the following crop in a rotation sequence (Ornat *et al.*, 1997; Thies *et al.*, 1998; Gine and Sorribas, 2017b).

Highly resistant bidi tobacco ABT 10 is released in 2008 and grown in root-knot infested fields by the farmers. Planting of root-knot resistant ABT 10 for six consecutive years in severely infested field (RKI > 4.00) at BTRS farm drastically reduced root-knot disease (< 1.00 RKI) on field tolerant MRGTH 1 in seventh year (Ebbad, 2016). However, no information is available about the minimum effective duration of rotation with resistant variety. Therefore, present experiment is planned to find out minimum effective duration of rotation with resistant variety to minimize the soil borne root-knot disease.

MATERIALS AND METHODS

A field experiment was conducted for six years (2017-18 to 2022-23) in randomized block design. In six consecutive years, A 119 susceptible variety

was planted after one, two, three and four year rotation with resistant variety ABT 10. All the treatments were replicated three times with a plot size of 6.3 x 4.5 m. All the recommended agronomic

practices in vogue were followed. Observations on root-knot index and cured leaf yield were recorded and data were analyzed following standard statistical method.

Treatments details:

Rotation Treatment	Year					
	I	II	III	IV	V	VI
1 year with ABT 10	ABT 10	A 119	ABT 10	A 119	ABT 10	A 119
2 year with ABT 10	ABT 10	ABT 10	A 119	ABT 10	ABT 10	A 119
3 year with ABT 10	ABT 10	ABT 10	ABT 10	A 119	A 119	A 119
4 year with ABT 10	ABT 10	ABT 10	ABT 10	ABT 10	A 119	A 119
Susceptible A 119	A 119	A 119	A 119	A 119	A 119	A 119

RESULTS AND DISCUSSION

The results revealed that a significant differences among the treatments for root-knot index was observed (Table 1). Four years of rotation in which first, second, third and four years were transplanted with a resistant variety ABT 10 followed by susceptible variety A 119 recorded 1.30, 1.53, 1.78 and 0.90 root-knot index, respectively. Whereas maximum root-knot index 4.53 was noticed when susceptible variety A 119 grown continuously for four years. After four year rotation with resistant variety ABT 10, root-knot index decreased up to 80 per cent in susceptible variety A 119 (Table 2). The nematode population was remains lower with the continuous planting of resistant variety ABT 10.

Resistant variety ABT 10 rotated first, second, third and four years with susceptible variety A 119 yielded significantly superior cured leaf yield 1548, 1790, 1825, 1604 kg/ha, respectively. A susceptible variety A 119 transplanted constantly in same plot for four year yielded statistically lower cured leaf yield 1188 kg/ha (Table 3). The yield was also increased up to 35 per cent in A 119 after four-year of rotation with resistant variety ABT 10 in comparison with susceptible variety A 119 continuously grown for four years. Our results are comparable with results of vegetable rotation trials where root gallings of eggplant was lwss when grown

in rotation with *M. incognita* resistant cowpea than when grown in rotation with susceptible okra (McSorley and Dickson, 1995).

Talavera *et al.*, (2009) reported the *Mi*resistant tomato cv. Monika suppressed *M. javanica* at Barcelona and Eivissa, and *M. arenaria* and *M. incognita* at Ca'diz, and prevented nematode population increases by more than 90% compared with the susceptible cv. Durinta. At Barcelona, the 3- year average tomato yield increased by 2.6 kg/m² in the rotations including at least one resistant tomato crop, and by 6.1 kg/m² when the resistant cultivar was cropped for two consecutive years. Planting of root-knot resistant variety ABT 10 for six years prior to susceptible variety GABT 11, gradually increased root-knot disease in subsequent years without adverse effect on yield of GABT 11 (Ebhad and Patel, 2016). These reports were more or less in agreement of our findings.

CONCLUSION

It can be concluded that nematode infected field transplanted with root-knot resistant variety ABT 10 for three to four years effectively manage population of root-knot nematode in the soil. In turn after three to four years a susceptible variety A 119 transplanted in a same field resulted in significantly higher cured leaf yield with minimum root-knot disease.

Table 1: Effect of rotational treatment on root-knot index (0-5) of susceptible variety

Sr. No.	Rotation treatment	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
1	1 st year with ABT 10	1.00(0.00)*	1.51(1.30)	1.00(0.00)	1.98(2.93)	1.00(0.00)	1.60(1.58)
2	2 nd year with ABT 10	1.00(0.00)	1.00(0.00)	1.59(1.53)	1.00(0.00)	1.00(0.00)	1.61(1.60)
3	3 rd year with ABT 10	1.00(0.00)	1.00(0.00)	1.00(0.00)	1.66(1.78)	1.88(2.60)	1.69(1.85)
4	4 th year with ABT 10	1.00(0.00)	1.00(0.00)	1.00(0.00)	1.00(0.00)	1.37(0.90)	1.43(1.05)
5	A 119	1.93(2.75)	1.88(2.60)	2.36(4.55)	2.32(4.38)	2.37(4.53)	2.39(4.70)
	S,Em. $\pm$	0.029	0.08	0.02	0.04	0.08	0.03
	C. D. at 5 %	0.090	0.24	0.06	0.12	0.237	0.108
	CV %	4.930	12.08	2.97	5.00	10.08	3.97

*Figure in parenthesis is original value, while outside is $\sqrt{x+1}$ transformation 0=Free, 5=Maximum disease intensity

Table 2: Per cent decrease over control in root knot index

Sr. No.	Rotation Treatment	Percent decrease over control (%)				
		2017-18	2018-19	2019-20	2020-21	2021-22
1	1 st year with ABT 10	-	50.00	-	-	-
2	2 nd year with ABT 10	-	-	66.37	-	-
3	3 rd year with ABT 10	-	-	-	59.36	-
4	4 th year with ABT 10	-	-	-	-	80.13
5	Susceptible A 119	-	-	-	-	-

Table 3: Effect of rotational treatment on cured leaf yield (kg/ha) of susceptible variety

Sr. No.	Rotation Treatment	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
1	1 st year with ABT 10	2030(ABT 10)	1548(A 119)	2206(ABT 10)	1721(A 119)	2048(ABT 10)	2427(A 119)
2	2 nd year with ABT 10	2098(ABT 10)	2168(ABT 10)	1790(A 119)	2352(ABT 10)	2091(ABT 10)	2630(A 119)
3	3 rd year with ABT 10	2115(ABT 10)	2392(ABT 10)	2234(ABT 10)	1825(A 119)	1506(A 119)	2644(A 119)
4	4 th year with ABT 10	2089(ABT 10)	2474(ABT 10)	2346(ABT 10)	2355(ABT 10)	1604(A 119)	2851(A 119)
5	A 119	1997	1487	1445	1556	1032	1188
	S,Em. $\pm$	39.64	148.18	120.50	66.46	67.67	101.45
	C. D. at 5 %	NS	456.63	371.32	204.81	208.53	312.63
	CV %	3.84	14.72	12.03	6.78	8.17	8.64

Table 4: Percent increase over control in cured leaf yield

Sr. No.	Rotation Treatment	Percent increase over control (%)				
		2017-18	2018-19	2019-20	2020-21	2021-22
1	1 st year with ABT 10	-	3.94	-	-	-
2	2 nd year with ABT 10	-	-	19.27	-	-
3	3 rd year with ABT 10	-	-	-	14.74	-
4	4 th year with ABT 10	-	-	-	-	35.66
5	Susceptible A 119	-	-	-	-	-

Table 5: Nematode population/ 200 cc soil

Sr. No.	Rotation treatment	Initial				Final			
		Root-knot	Reni form	Stunt	Total	Root-knot	Reni form	Stunt	Total
1	1 st year	286	410	324	1020	690	623	540	1853
2	2 nd year	380	326	395	1101	780	524	429	1733
3	3 rd year	485	324	362	1171	710	510	560	1780
4	4 th year	335	276	280	891	650	610	490	1750
5	Control	840	634	490	1964	1980	890	840	3710

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