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STUDIES ON THE CULTURAL AND CHEMICAL CONTROL OF BROOMRAPE IN TOBACCO

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ABSTRACT

Three field experiments were carried out as on-farm research in the cultivators field to control the broomrape (*Orabanche cernuaL.*) in tobacco (*Nicotiana tobacum* L.) by growing the trap crops of broomrape as intercrop, by swabbing broomrape shoots with oils and application of herbicides. The trap crops grown as intercrop with tobacco did not prove useful in reducing the broomrape infestation. Swabbing the broomrape shoots before flowering with organic and mineral oils caused around 70 per cent reduction in broomrape shoots. The herbicides did not affect the broomrape germination and shoot growth appreciably. Plant hole application of either coppersulphate 5 per cent solution or powdered neem cake at 100 or 200 kg/ha considerably reduced broomrape infestation.

KEYWORDS: Tobacco, Broomrape, Control methods

The most extensive areas of broomrape infestation are those involving *Orabanche ceruna* Loefl. (= *O. cumana* Wallr.) on sunflower, faba bean, tobacco and other Solanaceae crops. Broomrape can cause anything upto complete crop failure and that losses of 30 to 50 per cent commonly occur under heavy infestation, while the losses over whole regions may average 5 to 15 per cent (Parker,1991). Crop rotation into non-host crops (bean, sorghum, maize and cucumber) continues to be almost universally recommended as trap crops or false hosts for broomrape in tobacco which offer the advantage of stimulating germination of the parasite without themselves being parasitized (Labrada and Perez, 1988). Though broomrape shoots are removed after emergence, significant yield increase in tobacco by hand pulling has been reported (Foy *et al.*, 1989). The successful prevention of attack by root parasites has been rarely achieved by preventive herbicides. Foy *et al.*,(1989) have pointed out the potential use of glyphosate for broomrape control in tobacco. Imazaquin and imazethapyr also provided selective control of broomrape soon after its attachment with host plant roots (Sauerborn *et al.*, 1989). For the control of established broomrape use of allyl alcohol and vegetable oils with simple wiping device have been recommended.

MATERIALS AND METHODS

Three field experiments were conducted as on-farm research in the cultivators field of Panayampalli village of Bhavanisagar block of Periyar district during 1993 and 1994 monsoon season under irrigated situation. The experiments were laid out in randomised block design with four replications. The tobacco cv. Bhakialaksmi of 120 days duration was planted at a spacing of 75 x 60 cm and fertilized with 150:100:100 NPK kg/ha.

Experiment I : Effect of trap crops grown as intercrop on the control of broomrape in tobacco

Growing of trap crops in rotation with tobacco is a sound cultural practice for broomrape control. However, the tobacco farmers in these areas can grow only one crop in a year (monsoon season) as the rainfall and irrigation facilities (lift irrigated) are limited to facilitate crop rotation preceding to tobacco. As the situation do not permit to have a crop rotation with tobacco, to induce suicidal germination of broomrape before growing main host (tobacco), an attempt was made to grow the trap crops (sorghum, blackgram, sunflower and gingelly) as intercrop in tobacco and were sown on the day of tobacco planting (Table I).

Table 1. Effect of trap crops as intercrop in the control of broomrape in tobacco

Treatments	No. of broomrape shoots/plant 60DAP	Broomrape control (%)	Tobacco dry leaf yield (g/plant)	Yield increase over control (%)
No trap crop	10.2		103	
Sorghum	8.9	11.3	110	9.2
Blackgram	8.9	10.2	110	11.2
Gingelly	9.0	12.0	101	0.5
Sunflower	11.0	(-)11.2	93	(-)9.6
Hand pulling	2.0	82.3	128	27.3
CD(P=0.05)	2.4		15	

Experiment II : Post emergence control of broomrape with organic and mineral oils in tobacco

The treatments consisted of periodical swabbing the emerging tender broomrape shoots on the top with 2 drops of groundnut oil, gingelly oil, undiluted kerosene and soil drenching with copper sulphate 5 per cent compared with hand pulling of broomrape and uncheked control (Table 2).

Experiment III : Chemical control of broomrapein tobacco

The herbicidal treatment (glyphosate, clomazone, fluazifop butyl each at 0.1 and 0.2%) were given twice. First application was made before emergence of broomrape (4 weeks after planting tobacco) and the second application was made at the time of first broomrape shoot emergence (8-10 weeks after tobacco planting). The other treatments include plant-hole soil drenching of copper sulphate 5% and neem cake application at 100 or 200 kg/ha and were compared with unchecked broomrape plot (Table 3).

The emerged broomrape shoots were counted 60 days after planting (DAP) of tobacco and the effect of treatments was assessed on the basis of per cent control of broomrape and dry leaf yield of tobacco.

Table 3. Chemical control of broomrape in tobacco

Treatments	No. of broomrape shoots/plant 60DAP	Broomrape control (%)	Tobacco dry leaf yield (g/plant)	Yield increase over control (%)
Unchecked broomrape	13.0		105	
Glyphosate 0.1%	12.2	4.5	109	3.7
Glyphosate 0.2%	11.7	9.5	108	3.4
Clomazone 0.1%	11.6	9.8	97	(-)7.0
Clomazone 0.2%	11.6	11.1	93	(-)11.5
Fluazifob butyl 0.1%	11.8	9.3	108	2.7
Fluazifob butyl 0.2%	11.6	9.3	107	2.2
Copper sulphate 5%	9.4	27.1	116	10.1
Neem cake 100 kg/ha	8.8	31.6	120	14.3
Neem cake 200kg/ha	8.8	31.7	125	19.6
CD(P=0.05)	1.6		7	

RESULTS AND DISCUSSION

The results of Experiment I reveal that intercrops (sorghum, blackgram and gingelly) were able to reduce the broomrape infestation only about 10% compared to 82.3% by hand removal (Table 1). As a result, hand removal of broomrape favoured tobacco growth and increased the dry leaf yield by 27.3%, while intercropping with sorghum and blackgram could able to increase the tobacco yield only 10% compared to the yield under uncontrolled broomrape plot. Krishnamurthy and Rao (1976) observed substantial suppression of broomrape plot. Krishnamurthy and Rao (1976) observed substanial suppression of broomrape population with crop rotation. The stimulatory effect of sunflower on broomrape needs further study.

The data obtained from Experiment II (Table 2) show that swabbing the broomrape shoots with

Table 2. Post-emergence control of broomrape with organic and mineral oils in tobacco

Treatments	No. of broomrape shoots/plant 60DAP	Broomrape control (%)	Tobacco dry leaf yield (g/plant)	Yield increase over control (%)
No treatment	10.1	-	102	-
Swabbing with groundnut oil	2.6	75.9	108	5.5
Swabbing with gingelly oil	2.7	73.6	110	8.5
Swabbing with kerosene	2.6	71.8	111	8.8
Soil drenching of copper sulphate 5%	2.1	78.4	120	18.2
Hand removal of broomrape	1.1	88.6	129	26.6
CD(P=0.05)	3.4		6	

oils and soil drenching with copper sulphate 5% solution offered high mortality of broomrape shoots (72 - 78%) which is comparable to hand removal (89%). However, there was not much difference in dry leaf yield between oil treated and control plot. This is due to parasitic potential in debilitating the crop while insubterranean stage itself (Parker, 1991). Hence, broomrape control with oils might help in reducing the seed inoculam potential only, but not in improving the already affected crop yield. Soil drenching with copper sulphate 5% solution and hand removal of parasitic shoots increased the yield by 18.2 and 26.6% respectively over unchecked broomrape plot.

The herbicides evaluated under Experiment III did not affect the broomrape germination and shoot growth appreciably. In contrast clomazone caused crop phytotoxicity in terms of chlorophyll bleaching and reduced tobacco leaf yield by 10% compared to control. Varying degree of selectivity of crop for different herbicides have been reported (Castejon - Munoz *et al.*, 1990). Broomrape infestation was substantially reduced by pre-planting neem cake application and copper sulphate 5% soil drenching (32%) and these treatments increased the tobacco leaf yield by 19.6 and 10.1% respectively over control (Table 3).

The results of the experiments suggest that attempt to grow trap crops of broomrape as intercrop with tobacco instead of adopting crop rotation did not prove useful in reducing the parasitic weed infestation. Though tedious and costly, either hand pulling or swabbing of broomrape shoots with oils before flowering could be a viable technology in reducing the seed inoculation and future infestation. Alternatively, soil drenching with copper sulphate 5% solution and neem cake application at 100 or 200 kg/ha could be effective in restricting broomrape infestation in tobacco.

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