Indian J. Plant. Prot VII (2)

EFFECT OF CROP ROTATION AND PLANTING TIME ON THE INCIDENCE OF WILT IN LENTIL *

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ABSTRACT

In a crop rotation experiment, paddy and sorghum sown in the kharif reduced the lentil wilt in the succeeding rabi. In the same treatments higher grain yields were also recorded. Comparatively low incidence of wilt was recorded in December 15 planting than the earlier plantings.

Lentil is an important pulse crop cultivated in several countries including Argentina Czechoslavakia, Hungary, India, Uruguay, U.S.A and U.S.S.R. The crop is faced with a few important diseases, of which wilt caused by *Fusarium oxysporum* f.sp. *lentis*, causes serious yield losses. The mortality of plants due to wilt has been reported heavy and extent of mortality varies from about 25% in seedling stage to 50% in flowering stage. This disease was found to be widespread in hot weather than cold weather in Uruguay (Carrera and Noll, 1941). Myalova (1973) observed that the lentil wilt was seven times more in early sowings than in late ones. Vasudeva and Srinivasan (1952) reported the occurrence of this disease in Delhi during early winter (November) reaching a maximum at the transition period of winter to summer (March). The present investigations were undertaken to explore the possibilities of reducing lentil wilt by following suitable crop rotation and adjusting in the date of planting.

MATERIALS AND METHODS

Lentil cultivar, L9-12, was used in all the trials. The seed rate used was 30 kg/ha. The plot size was 2×5 metres and the space between two rows was 22.5 cm.

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* Part of the Ph.D. thesis submitted by the senior author to the G. B. Pant University of Agriculture and Technology, Pantnagar, 1974.

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Crop rotation trial :

Two experiments were conducted in the rabi season, the first in 1972-73. and the second in 1973-74. Lentil was cultivated in the plots in which paddy, sorghum, maize or soybean was grown in the preceeding kharif season in a wilt sick plot. The inoculum was built up in that plot by continuous cultivation of wilt susceptible varieties of lentil for the three previous seasons and thus obtaining a 'wilt-sick' plot. One of the treatments in the kharif season was fallow. Randomized block design was used with four replications in both the experiments. Observations on wilt incidence were recorded up to pre-harvest time.

Date of planting trial :

Trials were conducted with six dates of planting commencing from October 1 to December 15 at 15-day intervals in a wilt-sick plot, with four replications in a randomized block design. The data on wilt incidence were recorded up to pre-harvest time.

Scoring for wilt :

Wilt incidence was scored at fortnightly intervals from the day of emergence till harvest. Since flowering commences by about 45 days, whereafter mortality of the adult plants may affect the grain yield markedly, the scoring was grouped into two stages as given below :

$$\text{Percent seedling wilt} = \frac{\text{Total wilted plants within 45 days}}{\text{Total population}} \times 100$$

$$\text{Percent adult plant wilt} = \frac{\text{Total wilted plants after 45 days}}{\text{Total population} - \text{Number of plants wilted within 45 days}} \times 100$$

RESULTS AND DISCUSSION

Crop rotation trial :

The data presented in Table 1 reveal that there was a reduction in the seedling wilt in the plots which were under paddy in both the seasons. In the same plots, the adult plant wilt was also less in 1972-73 but it was more in 1973-74. A similar trend was observed for wilt incidence in the plots which were under sorghum. The data (Table 1) showed that there was significantly higher grain yield in the plots which were under paddy and sorghum in 1972-73, whereas in 1973-74 highest grain yield was recorded in the plots which were under paddy.

Table 1. Effect of crop rotation on the incidence of seedling wilt, adult plant wilt and grain yield of lentil

Crops	Seedling wilt (%)*		Adult plant wilt (%)*		Grain yield in q/ha*	
	1972-73	1973-74	1972-73	1973-74	1972-73	1973-74
Paddy	0.7	4.8	2.9	35.1	7.6	10.1
Sorghum	2.6	12.1	6.0	36.6	6.0	6.5
Maize	3.2	20.5	12 4	36,2	4.2	7.6
Soybean	3.3	27.0	12.1	54.9	2.8	7.4
Fallow	12.5	24.5	13.1	38.5	4.0	4.1
C. D. (5%)	2.4**	3.0**	NS	11.2*	2.8**	4.0**

*Average of 4 replications
**Significant at 5% level
NS—Not significant

Date of planting trial :

Among the different dates of planting, the least incidence of seedling wilt was observed with December 15 planting in both the seasons tested (Table 2). Planting on December 1 was next in rank in 1972-73 and in 1973-74 this date ranked only third. Incidence of wilt in adult plants did not indicate any trend relating to planting dates. Nevertheless, less total wilt (seedling wilt + adult plant wilt) incidence was found in December 15 planting in both the seasons.

Table 2. Effect of date of planting on seedling wilt, adult plant wilt and grain yield of lentil

Date of planting	Seedling wilt (%)*		Adult plant wilt (%)*		Grain yield in q/ha*	
	1972-73	1973-74	1972-73	1973-74	1972-73	1973-74
October 1	16.6	24.8	10.5	24.9	3.4	13.1
October 15	2.2	22.6	36.4	17.7	5.3	16.9
November 1	13.6	9.1	20.2	11.4	4.8	14.2
November 15	2.9	33.9	42.1	7.0	4.7	14.6
December 1	1.0	11.9	61.4	8.3	3.1	10.2
December 15	0.6	3.1	21.8	5.4	5.1	6.9
C. D. (5%)	2.1**	2.1**	3.9**	6.1**	NS	NS

*Average of 4 replications
**Significant at 5% level
NS—Not significant

Crop rotation is undoubtedly one of the promising ways of eliminating soil-borne inoculum (Stover, 1955; Menon and Williams, 1957; Kincaid, 1960; and Minton, 1972). The physical, chemical and biological status of soil either individually or in combination could influence the growth, survival and parasitic activities of root disease fungi as a consequence of crop rotation. Overall incidence of wilt, in both the seasons, was found to be relatively low in plots which were under paddy or sorghum in kharif. In the case of paddy, frequent irrigations were given and this might have helped in minimizing the *F. oxysporum* f. sp. *lentis* population by reducing soil aeration or by leaching out of the chlamydospores. Stover (1955) and Lims (1972) reportedly observed less *Fusarium* population in flooded soils. Sorghum crop in the preceding season could bring down the wilt caused by *Verticillium albo-atrum* in cotton (Minton, 1972) and also the pigeonpea wilt caused by *F. udum* (Bose, 1939). Maximum grain yield was obtained in plots which had paddy as the preceding crop in both the seasons. In case of sorghum as the previous crop, such greater yield was observed in one season only.

Alteration in the date of planting has an important practical bearing on the incidence of wilt. Certain dates of planting may be helpful in avoiding periods particularly favourable to the pathogen. Among the six fortnightly plantings tested, the least overall wilt incidence was observed with December 15 planting. During preceding five fortnights no definite trend in disease incidence was observed. Such low incidence in late December planting was apparently influenced by cooler temperature. Vasudeva and Srinivasan (1952) reported that the pathogen *F. oxysporum* f. sp. *lentis* requires a moderately high temperature (27° to 30°C) for its growth and development. Evidently the cool conditions following December 15 planting might have curbed the damage by the pathogen and hence the low disease incidence. Such a response has also been obtained by Myalova (1973) in lentil wilt in U. S. S. R.

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