Original Research Article

Estimation of yield losses for major diseases (late leaf spots) in hot spot location on groundnut (*Arachis hypogaea* L.)

ABSTRACT

Late leaf spot (LLS, *Phaeoisariopsispersonata L.*) is the major bioticconstraintofgroundnut(*Arachishypogaea*L.) productivity in hot spot location in Maharashtra.The aim of thisstudy was to determine the yield losses due to attack of diseases, with and without usingtebuconazole. Management ofLLS through fungicides was evaluatedwith eight treatmentsin randomized block design with three replications during*Kharif*,2021,2022and2023 at Oilseed Research Station,Jalgaon, Maharashtra.Applications of fungicide sprays impact on the development of *Cercospora* late leaf spot and reduce its intensity**.** The significantly lowest pod yield loss 0% and haulm yield loss 0 % was shown by the treatment T4 *i.e* foliar spray of Tebuconazole 25.9 EC at 50, 65, 80 and 95 Days After Sowing (DAS) as compared to control treatment (T8) *i.e* (36.85 %) and (15.07 %), respectively. It was followed by treatment T3 *i.e.* Tebuconazole 25.9 % EC at 50, 65 and 80 DAS and treatment T5 *i.e*. Tebuconazole 25.9 %EC at 65, 80 and 95 DAS.Influence of fungicide used for disease management was apparent on yield. The pod and haulm yield loss in treatment T5 was (7.75%) and (5.89 %), respectively. The highest BCR was recorded by treatment T4 (5.41), it was followed by treatment T5 (5.32) and treatment T3 (5.08), respectively.

Key words: Management, LLS, disease, groundnut

INTRODUCTION

Groundnut(*Arachishypogea*L.)alsoknownaspeanut or earthnut or money nut is a member belongs to family *Leguminosae*and sub-family *Papilionaceae*.It is one of the important oilseed crops in the world often known for its global economic significance not only for its wide spread distribution, but also for the even wider areas of processing and consumption.Groundnut was introduced in India by around 16th centurybythePortuguese.Itisgrownunderawiderangeofenvironmental conditions encompassing latitudes between40° South and 40° North of the equator. There are a feweconomically important foliar fungal diseases, such as early and late leaf spots, commonly called as 'tikka'diseases.Late leaf spot caused by *Phaeoisariopsispersonata*arecommonly presentwherevergroundnutisgrown.Astheareaundergroundnutispredominantin*kharif* (rainy) season the foliar diseases like late leaf spotmay cause yield losses up to 50% in the semi-aridtropics. In India, late leaf spot is more severe than early leafspot (Ghewande, 1990). It causes severedefoliation and reduces pod yields by more than 50% if thecrop is not protectedwithchemicals (Shew *etal*.,1988).The fungicides are the most common tools for controllingdiseaselosses.It contributes significantly towards food and nutrition security, serving as a good source of dietary protein, fats, vitamins, minerals and

micronutrients. The crop also contributes to improving soil fertility *via* biological nitrogen fixation and organic matter returns to the soil while its haulms and provide valuable supplementary feed for livestock especially during the long dry season.

India is the second largest producer of groundnuts after China. Groundnut is the largest oilseed in India in terms of productionwith 86.54 lakh tons production,2023 (Anon., 2023).Late leaf spot caused by *Cercosporidiumpersonatum*(Berk. and Curt) Arx. are the major diseases of groundnut worldwide? The leaf spot diseases can cause 30 to 70 per cent loss in pod yield and reduction in the kernel quality (Reddy *et al.,* 1997). Besides causing quantitative losses, these diseases are responsible for reduction in protein content and oil recovery (Gupta *et al.,* 1987). Losses yield due to the diseases was recorded about 15 to 59 per cent in groundnut (Kumar and Thirumalaisamy, 2016). In the semi-arid tropics, where chemical control is generally not practiced, losses in excess of 50 per cent were common. This disease of groundnut is very destructive on a world-wide scale as evident from maximum yield losses ranging from 10 to 50 per cent. Without the foliar application of fungicides, the disease could cause up to 100 per cent defoliation prior to harvest and losses in excess of 50 per cent of potential yield. But this loss varies considerably from locality to locality and also between seasons (McDonald *et al*., 1985).

Leaf spots are the most common and serious diseases of groundnut in northern Ghana. Previous research on identifying yield gaps in northern Ghana showed that ELS and LLS together cause pod yield losses in the range of 10 to 50 per cent (Tsigbey*et al*., 2001 ab). These diseases also have an adverse influence on seed quality as well as on quality of haulms (SARI, 2002).

Leaf spot can be managed by applying fungicides during the most vulnerable periods of fungal infection; that is, when excessive moisture andhumidity occurs (Smith & Littrell, 1980). A few studies have shown that applying fungicides can reduce the severity of leaf spot and improve yields in West Africa (Waliyar*et al*., 2000).

Keeping this in view, the present work on ‘Estimation of yield losses for major diseases (LSS) in hot spot location on groundnut.

MATERIALANDMETHODS

A field experiment was laid out during *kharif*, 2021,2022 and2023usinggroundnutwith susceptible varietySB-XI for late leaf spot.Randomizedblock design with eight treatments of fungicidesapplied on different dates after planting distributed in three replications. The fungicides, sprays at 50, 65,80&95 DAS. The naturalincidence of LLS was recorded at 50, 65,80 & 95 DASusing0–9scale suggestedby Mayee andDatar(1986).On the basis of dry pod yield and haulm yield,pod yield and haulm yield losses were calculated and also the Benefit CostRatiowascalculated.

Experimental Details

Variety: SB-XI Plot Size: 4.2 x5m^2(Gross), 3.5 x5 m^2(Net)

Design: RBD

No. of Treatments: 8 No. of replications: 03

Treatment No.	**Treatment Detail**
T1	Tebuconazole 25.9 %EC at 50 DAS
T2	Tebuconazole 25.9 %EC at 50 and 65 DAS
T3	Tebuconazole 25.9 %EC at 50, 65 and 80 DAS
T4	Tebuconazole 25.9 %EC at 50, 65, 80 and 95 DAS
T5	Tebuconazole 25.9 %EC at 65, 80 and 95 DAS
T6	Tebuconazole 25.9 %EC at 80 and 95 DAS
T7	Tebuconazole 25.9 %EC at 95 DAS
T8	Water spray

RESULTSANDDISCUSSION

The statistically significant differences were observedin respect of per cent intensity of LLS as well asdry pod yield and haulm yield of groundnut.The results presented in table no. 1 revealed that, the treatment T_4*i.e* foliar spray of Tebuconazole 25.9 EC at 50, 65, 80 and 95 DAS was found statistically significant and showed lowest per cent disease index (19.97 %) which wasfound at par with T_5 (20.72 %) as compared to control and rest of the treatments. The per cent disease index in control treatment was 55.44 per cent.The significantly highest pod yield (13.94 q/ha) and haulm yield (22.79 q/ha) was shown by the treatment T4 *i.e* foliar spray of Tebuconazole 25.9 EC at 50, 65, 80 and 95 DAS as compared to control (8.93 q/ha) and (16.43 q/ha), respectively. It was followed by treatment T5*i.e.* Tebuconazole 25.9 %EC at 65, 80 and 95 DAS.

The significantly lowest pod yield loss 0 % and haulm yield loss 0 % was shown by the treatment T4 *i.e* foliar spray of Tebuconazole 25.9 EC at 50, 65, 80 and 95 DAS as compared to control treatment (T8) *i.e* (35.95 %) and (29.46 %), respectively. It was followed by treatment T5 and treatment T3.The pod and haulm yield loss in treatment T5 was (9.10%) and (9.46 %), respectively.The highest BCR was recorded by treatment T4 *i.e* 4.67, it was followed by treatment T5 (4.51) and treatment T3 (4.47), respectively.

So overall it was concluded that, the fungicidal sprays treatment reduced the late leaf spot severity as compared to control. The pod yield and haulm yield losses due to late leaf spot disease was (35.95 %) and (29.46 %) respectively in unprotected fungicidal sprays treatment when compared with highly protected sprays treatment. Moreover, the fungicidal sprays treatment was really effective and increased pod and haulm yields significantly as compared to control.

These research findings agreewiththeearlierworkersAlabi*etal*.(1993)evaluatedBenlate,DithaneM-

45andHexaconazolefungicidesfortheirefficiency
againstfoliardiseasesofgroundnutunderfieldconditionsandfoundHexaconazole fungicide as most effective in controlling the diseases andincrease pod and haulm yields.Jadeja *et al*. (1999) reported sprays ofHexaconazole (0.0025%) and Difenconazole (0.0125%) atthree times on 30, 45- and 60-days old plant to manage leafspotsandrustofgroundnutandreportedthatthefungicidesreducedleafspotandincreasedtheyieldssignificantly.Hexaconazoletreatmentshowed71%increaseinpodyieldand87%increaseinfodderyield.

JohnsonandSubrahmanyam(2003)reported that on groundnut hexaconazole (0.2%) fungiciderecordedminimumPercentDiseaseIndex(PDI)of18.8(LLS) and increased the pod and haulm yields by43and41percent,respectivelywhensprayedtwotimes on 60 and 75-daysoldplant.Seed treatment with Mancozeb @ 2 g/kg + three spraysofHexaconazole@1ml/lit.at45,60 and 75DASi.e.,T1 wassuperiorinminimizingthelate leaf spot disease.The highest podyieldand maximum CBR (1:30) was recorded whenseed treatment withMancozeb @ 2g/kg + three sprays ofHexaconazole @ 1ml/lit at 45, 60 & 75 DAS.

Patel *et.al*., 2022reported tebuconazole 50% + trifloxystrobin 25% at 0.05% (26.53%) followed by spraying of carbendazim 12% + mancozeb 63% at 0.15% (31.83%) in checking the leaf spot of groundnut. The economics of spraying of different fungicides revealed that the highest incremental cost: benefit ratio (ICBR) was obtained by three spraying of carbendazim 12% + mancozeb 63% at 0.15%, followed by Hexaconazole 5% at 0.005%.Nath*et.al.*2023 evaluated that impact of fungicides used for disease control was apparent on yield per plot.Tebuconazole @0.15% gave best result and increased yield up to 67 %.

Nutsugah*et.al*.2005 reported yield losses varied considerably, dependingon entry and its yield potential. Pod yield lossesdue to early and late leaf spot diseases ranged from 9.7 to 81.2 per cent in2003, and from 19.5 to 65.9 per cent in 2004 when yieldof protected entries was compared with yield of unprotectedentries.Paul and Yahaya,2017 reported from Ghana that late leaf spot, *Cercosporidiumpersonatum*(Berk. & Curt) are the most important in Ghana.apart from damaging the leaves, these fungi also cause lesions on petioles, pegs, and main shoots leading to substantial defoliation and yield losses.The leaf defoliation of greater than 80% and yield losses of up to 78% caused by *Cercospora*leaf spots on-farm in the Guinea savannah of Ghana.

Khan *et al.*2014reported that maximum disease control with high pod yield was observed with Nativo and Triazole treatments. Efficacy of Chlorothalonil was also better than Mancozeb and Propineb. Maximum disease control and pod yield was observed when Nativo was used @ 0.97g/L of water, followed by @ 0.65g/L and 0.32 g/L, respectively.

CONCLUSION

The significantly lowest pod yield loss 0% and haulm yield loss 0 % was shown by the treatment T4 *i.e* foliar spray of Tebuconazole 25.9 EC at 50, 65, 80 and 95 DAS as compared to control treatment (T8) *i.e* (36.85 %) and (15.07 %), respectively. It was followed by treatment T3

and treatment T5. The pod and haulm yield loss in treatment T5 was (7.75%) and (5.89 %), respectively. The highest BCR was recorded by treatment T4 *i.e* 5.41, it was followed by treatment T5 (5.32) and treatment T3 (5.08), respectively.

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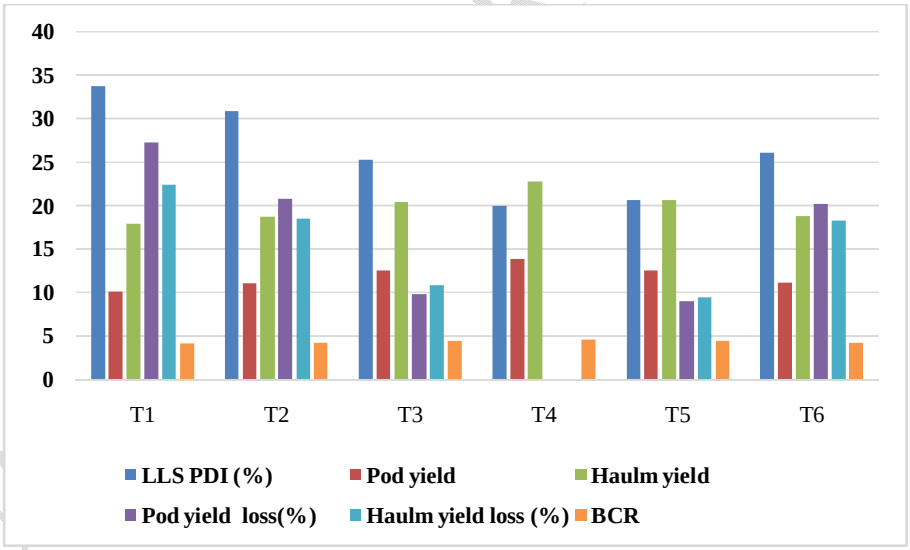

Fig .1 Bar graph showing Pod yield ratio

Table 1 :Estimation of yield lossfor Late Leaf Spot in Groundnut

Yield loss for Late Leaf Spot in Groundnut Pooled data:Kharif - 2021 to 2023

Treatments	LLS PDI (%)	Yield (q / ha)		% Yield Loss		BC
		Pod yield	Haulm yield	Pod yield	Haulm yield	
T1	33.76 (35.47)	10.14	17.93	27.24	22.39	4.1
T2	30.84	11.04	18.78	20.85	18.58	4.2

		(33.67)					
3	T3	25.35	12.58	20.40	9.83	10.87	4.47
		(30.21)					
4	T4	19.97	13.94	22.79	0.00	0.00	4.67
		(26.51)					
5	T5	20.72	12.61	20.72	9.10	9.46	4.51
		(27.04)					
6	T6	26.06	11.12	18.83	20.21	18.34	4.25
		(30.65)					
7	T7	36.53	9.91	17.61	28.98	23.66	4.07
		(37.07)					
8	T8	55.44	8.93	16.43	35.95	29.46	0.00
		(43.33)					
	SEm ±	1.39	0.10	0.36	0.73	2.31	0.13
	CD at 5%	4.22	0.31	1.11	2.20	7.02	0.40