JOURNAL OF PURE AND APPLIED MICROBIOLOGY, March 2016. Vol. **10**(1), p. 635-638

Bioefficasy of New Molecules Against Fungal Foliar Diseases of Groundnut

Yashoda R. Hegde, S. Ravichandran and Rajalaxmi Keshgond

Department of Plant Pathology, University of Agricultural Sciences, Dharwad - 580 005, India.

https://doi.org/10.22207/JPAM.10.1.87

(Received: 01 December 2015; accepted: 11 January 2016)

Field experiment was conducted at Main Agricultural Research Station, UAS, Dharwad , Karnataka for two years, during *Kharif*, 2012 and *Kharif,* 2013 to evaluate the new fungicides against leaf spot and rust of groundnut. Experiment was laid out in Randomized Block Design (RBD) with eight treatments and three replications. The variety used was JL 24. Plot size was 3m x 3m. Fluxapyroxad 167 g/l + Pyraclostrobin 333 g/L sc was evaluated at three concentrations viz., 0.04%, 0.05% and 0.06%. Other fungicides evaluated were Fluxapyroxad 300 g/l SC @0.05%, Pyraclostrobin 20% WG@0.1%, hexaconazole 5% EC@0.1% and carbendazim 50% WP @0.1%. Results revealed that combiproduct, Fluxapyroxad + Pyraclostrobin reduced the leaf spot and rust of groundnut and increased the yield significantly at all the concentrations tested (29.72, 28.89 and 29.54 q/ha, was at par with hexaconazole @ 0.1% (31.20%) and significantly superior to the untreated control(16.20q/ha.)

Keywords: Bioefficasy, Fluxapyroxad + Pyraclostrobin, foliar fungal disease, groundnut, hexaconazole.

Groundnut (*Arachis hypogaea* L.), also known as peanut belonging to the family Papilionaceae is an important oilseed, food and fodder crop which is one of the five most important oil seed crops of the world. Fungal diseases like leaf spots and rust are the major constraints in the cultivation of groundnut. Early leaf spot caused by *Cercospora arachidicola* and late leaf spot caused by *Phaeoisariopsis personata* are commonly present wherever groundnut is grown (Bharat *et al*.,2013)[1]. If not controlled, early leaf spot and late leaf spot diseases can cause extensive defoliation. Groundnut rust caused by *Puccinia arachidis* Speg. occurs in epidemic form in parts of northern Karnataka. The losses up to 29-42 per cent due to rust have been reported (Siddaramaiah,1983)[2]. Hence field experiments were conducted to evaluate the new fungicides for management of fungal foliar diseases like leaf spot and rust of groundnut.

* To whom all correspondence should be addressed.
E-mail: uasyashoda@rediffmail.com

MATERIALS AND METHODS

Field experiment was conducted at Main Agricultural Research Station, UAS, Dharwad, Karnataka during *Kharif*, 2012 and 2013. Sowing was done on 5-7-2012 and 18-6-2013 during 2012 and 2013 respectively. The variety used was JL 24. Experiment was laid out in Randomized Block Design with eight treatments and three replications. Plot size was 3m x 3m. First spraying was given soon after seeing initial symptoms. Second spray was given at an interval of 15 days. Total quantity of spray liquid used was @ 500 l/ha. All other agronomical practices were followed as per package of practices. Combiproduct ,Fluxapyroxad 167 g/l + Pyraclostrobin 333 g/lSC was tried at three concentrations as indicated below. Treatments were as follows.

1. Fluxapyroxad 167 g/l + Pyraclostrobin 333 g/lSC @ 0.04%

2. Fluxapyroxad 167 g/l + Pyraclostrobin 333 g/lSC @ 0.05%
3. Fluxapyroxad 167 g/l + Pyraclostrobin 333 g/lSC @ 0.06%
4. Fluxapyroxad 300 g/l SC @0.05%
5. Pyraclostrobin 20% WG@0.1%
6. Hexaconazole 5% EC @0. 1%
7. Carbendazim 50% WP@0. 1%
8. Untreated control

Observations for rust and leaf spot were recorded by following 0-9 scale (Mayee and Datar, 1986)[3]. Yield per plot was recorded and converted into per hectare for which the statistical analysis was done.

0 = No symptoms on leaf
1 = Few small necrotic spots covering 1% or less of the leaf area
3= Few small necrotic spots covering 1-5% of the leaf area
5= Spots coalescing, covering 6-20% of the leaf area
7= Spots enlarging, coalescing to cover 21-50% of the leaf area
9= Spots enlarging, coalescing to cover ≥51 % of the leaf area

Percent disease index was calculated by using the following formula (Wheeler,1969)[4]

$$(PDI) = \frac{\text{Sum of the individual disease rating}}{\text{No. of leaves observed} \times \text{Maximum disease grade}} \times 100$$

RESULTS AND DISCUSSION

Leaf spot severity

Leaf spot (Tikka disease) was severe during both the years of experimentation and pooled analysis is done. Results presented in table 1 indicate that all treatments have reduced the disease severity significantly compared to the untreated control. Minimum disease was observed in Fluxapyroxad 167 g/l + Pyraclostrobin 333 g/lSC @0.04% (17.41%) which was at par with Fluxapyroxad 167 g/l + Pyraclostrobin 333 g/lSC @0.05% (18.52%), Fluxapyroxad + Pyraclostrobin @0.06% (18.89%), Hexaconazole 5% EC @0. 1% (19.63%) and Pyraclostrobin 20% WG @0.1% (21.73%). Similar trend was observed during both years of experimentation. Effectiveness of pyraclostrobin was reported by different scientists. Culbreath *et al.,* 2002[5] reported that pyraclostrobin @ 168 g/ha or higher gave better leaf spot control than chlorothalonil applied at 1.26 kg/ha or tebuconazole applied at 227 g/ha on the same schedule. Similarly Pyraclostrobin was very effective in managing leaf spot in different crops like sugarbeet (Mohamed *et al*.,2007[6], early blight of tomato (Girija Ganeshan and Chethana, 2009[7]. In present investigation, hexaconazole was also equally effective in managing leaf spot of groundnut which is in agreement with the results of Gopal *et al.,*2003[8]. In addition, hexaconazole is also effective in managing the leaf spot in different crops like greengram (Veena *et al*.,2013(9):

Table 1. Evaluation of fungicides against leaf spot disease in groundnut

S. No.	Treatment	Leaf spot (PDI)		
		2012	2013	Pooled data
1	Fluxapyroxad + Pyraclostrobin @0.04%	20.25(26.62)*	14.57(22.41)	17.41(24.51)
2	Fluxapyroxad + Pyraclostrobin @0.05%	23.46(28.94)	13.58(21.62)	18.52(25.28)
3	Fluxapyroxad + Pyraclostrobin @0.06%	25.68(30.13)	12.09(20.34)	18.89(25.66)
4	Fluxapyroxad 300 g/l SC @0.05%	35.06(36.28)	27.90(31.88)	31.48(34.08)
5	Pyraclostrobin 20% WG @0.1%	28.15(31.99)	15.31(22.96)	21.73(27.48)
6	Hexaconazole 5% EC @0. 1%	26.17(30.63)	13.08(21.16)	19.63(25.49)
7	Carbendazim 50% WP @0. 1%	22.47(28.13)	25.92(30.53)	24.20(29.33)
8	Untreated control	52.59(46.49)	73.58(59.13)	63.09(53.13)
	S.Em	2.23	1.18	2.03
	CD at 5%	6.78	3.59	5.82
	CV (%)	11.95	6.52	16.21

*Figures in parentheses are arc sin transformed values.

Dubey and Singh,2010 [10], tobacco (Jahagirdar and Hundekar,2010 [11].

Rust severity

Rust was observed during 2012 and was absent during 2013 and hence the observations are recorded only for one year. Results presented in Table 2 indicate that all treatments have reduced the disease incidence significantly compared to the untreated control (58.02). Minimum disease was observed in hexaconazole 5% EC (17.28) which was at par with Fluxapyroxad 167 g/l + Pyraclostrobin 333 g/lSC @0.04% (22.22%), Fluxapyroxad 167 g/l + Pyraclostrobin 333 g/lSC @0.05%(23.45%), Fluxapyroxad 167 g/l + Pyraclostrobin 333 g/lSC @0.06%(25.68%). Fluxapyroxad and carbendazim were least effective against rust with 60.50% and 47.90% disease respectively. Effectiveness of hexaconazole was documented by scientists in different crops like wheat (Chaudhary and Chaudhari,2013(12), groundnut (Sunkad and Kulkarni.2006 (13) and soybean (Baiswar *et al*.,2011[14].

Yield

Pooled data analysis(Table 3) indicate that all treatments have increased the yield significantly compared to untreated control which recorded 16.20q/ha. Maximum yield was recorded in hexaconazole (31.20q/ha) which was at par with Fluxapyroxad 167 g/l + Pyraclostrobin 333 g/lSC @ 0.04% (29.72q/ha), Fluxapyroxad 167 g/l + Pyraclostrobin 333 g/lSC @0.06% (29.54q/ha) , Fluxapyroxad 167 g/l + Pyraclostrobin 333 g/lSC @0.05% (28.89q/ha) and Pyraclostrobin 20% WG @0.1% (29.91q.ha). The present finding was supported by Sunkad and Kulkarni,2006 who observed that lower disease index with increase in

Table 2. Evaluation of fungicides against rust disease in groundnut

S. No	Treatment	Rust (PDI)
1	Fluxapyroxad + Pyraclostrobin @0.04%	22.22(28.06)*
2	Fluxapyroxad + Pyraclostrobin @0.05%	23.45(28.95)
3	Fluxapyroxad + Pyraclostrobin @0.06%	25.68(30.41)
4	Fluxapyroxad 300 g/l SC @0.05%	60.50(51.20)
5	Pyraclostrobin 20% WG @0.1%	32.10(34.46)
6	Hexaconazole 5% EC @0. 1%	17.28(24.46)
7	Carbendazim 50% WP @0. 1%	47.90(43.78)
8	Untreated control	58.02(49.67)
	S.Em	2.43
	CD at 5%	7.37
	CV (%)	11.57

*Figures in parentheses are arc sin transformed values.

Table 3. Evaluation of fungicide treatments on yield in groundnut

S. No.	Treatment	Yield (q/ha).		
		2012	2013	Pooled data
1	Fluxapyroxad + Pyraclostrobin @0.04%	28.89	30.56	29.72
2	Fluxapyroxad + Pyraclostrobin @0.05%	27.04	30.74	28.89
3	Fluxapyroxad + Pyraclostrobin @0.06%	25.93	33.15	29.54
4	Fluxapyroxad 300 g/l SC @0.05%	24.82	22.59	23.70
5	Pyraclostrobin 20% WG @0.1%	31.29	28.92	29.91
6	Hexaconazole 5% EC @0. 1%	31.11	31.29	31.20
7	Carbendazim 50% WP @0. 1%	23.33	22.96	23.15
8	Untreated control	15.56	16.85	16.20
	S.Em	2.05	1.44	1.33
	CD at 5%	6.21	4.36	3.83
	CV (%)	13.65	9.19	12.31

pod and haulm yield and also maximum benefit cost ratio (BCR) were recorded in plots receiving three sprays of hexaconazole in a susceptible cultivar KRG-10.

It can be concluded that Fluxapyroxad 167 g/l + Pyraclostrobin 333 g/lSC reduced the leaf spot and rust of groundnut and increased the yield significantly at all concentrations evaluated. (viz., @ 0.04, 0.05 and 0.06%)

ACKNOWLEDGEMENTS

We are grateful to **BASF India Limited** for providing financial assistance during this investigation.

REFERENCES

1. Bharat Chandra Nath, J. P. Singh, Seweta Srivastava and R. B. Singh Management of late leaf spot of groundnut by different fungicides and their impact on yield. *Plant Path J.*, 2013; **12(2):** 85-91.
2. Siddaramaiah, A. L. Groundnut rust research in Kamataka. *Plant Pathology Newsletter*, 1983; **1**: 12-13.
3. Mayee, C. D. and Datar, V. V. *"Phytopathometry". Technical Bulletin-I*, Marathawad Agricultural University, Parbhani, India, 1986; 146 pp
4. Wheeler, B. E. An introduction to plant diseases. John Willey and Sons Ltd., London. 1969;89.
5. Culbreath, A. K., Brenneman, T. B., and Kemerait, R. C., Jr. Management of early leaf spot of peanut with pyraclostrobin as affected by rate and spray interval. Online. Plant Health Progress doi:10.1094/PHP-2002-1018-01-RS.
6. Mohamed F.Khan, Greg Richards, Jahangir, Khan, R. Harikrishnan, R. Nelson, and Carl A.Bradley, Effect of Adjuvants on the Performance of Pyraclostrobin for Controlling Cercospora Leaf Spot on Sugarbeet, *J. Sugar Beet Res.* 2007; **44**(3 & 4):71-81.
7. Girija Ganeshan and B.S. Chethana. Bioefficacy of Pyraclostrobin 25%EC Against Early Blight of Tomato , *World Applied Sci*. J. 2009; **7 (2)**: 227-229, 2009.
8. Gopal K., R.Jagadeeshwar and G.P.Babu. Efficasy of new systemic fungicide in controlling late leaf spot and rust in groundnut. *Indian J. plant prot.*, 2003; **31**:76-79.
9. Veena, Yashoda R.Hegde**,** Ganajaxi Math and A.G.Vijaykumar**.** Bioefficasy of fungicides against *Cercospora canescens* causing leaf spot of greengram. *Crop Res.*, 2013;**46**:74-78.
10. Dubey S.C.,and Siingh B. Seed treatment and foliar application of insecticides and fungicides for management of Cercospora leaf spot and yellow mosaic of mungbean.(*Vigna radiata*). *International J. pest management*, 2010; **56**:309-14.
11. Jahagidar S. and Hundekar, A.R. Management strategies against frog eye leaf spot pathogen (*Cercospora nicotianae*) in India. *Indian Phytopath.*, 2010; **63**:63-65.
12. Chaudhary R. F. and M. G. Chaudhari. Effect of fungicides and plant extracts on Uredospores germination of *Puccinia recondita* f. sp.*tritici. The bioscan*, 2013; **8(1)**:59-62.
13. Gururaj Sunkad and Srikant Kulkarni. Assessment of pod and haulm yield losses due to rust of groundnut caused by *Puccinia arachidis* Speg. in northern Karnataka. *Indian Phytopath.* 2006; **59 (1)** : 56-61.
14. Baiswar P., N.Tiameren A, D.N. Upadhyay and S. Chandra. Management of soybean rust caused by *Phakopsora pachyrhizi* using fungicides, botanicals and biocontrol agents in Mid-hills of Meghalaya. *Indian J. hill farm.* 2011; **24**(2):33-37.