

## Original Research Article

<https://doi.org/10.20546/ijcmas.2020.910.451>

## Study of White Rust (*Albugo candida*) Management Approach in Indian Mustard (*Brassica juncea*) at Farmers Fields through on farm Testing (OFT) at Farmers Fields

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### ABSTRACT

In India, oilseed *Brassica* are grown over an area of about 6.3 million hectares with an annual production of 7.92 million tones with an average yield of 1304 kg/ha whereas in Rajasthan it was still 1422kg/ha. The severe attack of many diseases not only deteriorates the quality of the seed, but also reduces the oil content considerably. Among the diseases, white rust caused by *Albugo candida* (Pers. Ex Hook) O. Kuntze, is an important disease of a wide variety of *Brassica* crops. Its infection causes disfiguring white pustules on leaves, flowers stems and pod leading to yield losses. Mustard is an economic important crop in Alwar district of Rajasthan more than 2.5 lac ha area is under mustard cultivation. Management technology recommended for white rust disease has not much effective. Hence, looking for the improve disease management technology. So, there is need of assessment and refinement in technology through on-farm testing. The technology was evaluated through OFT during 2014-15 and 2015-16 cropping season in different villages of Bansur tehsil of Alwar district. In this area farmers used micro sprinkler irrigation along with high dense plant population and also provide frequent irrigations. The assessment and refinement of technology showed that the seed treatment with metalaxyl 35 SD and two foliar spray of metalaxyl 8% + mancozeb 64% (1<sup>st</sup> at 35-40 DAS and 2<sup>nd</sup> spray 65-70 DAS) along with timely sowing and 3-4 irrigation through sprinkle during the crop season recorded minimum disease intensity (8.2%) and maximum yield 1875 Kg/ha as compare to farmers practices (disease intensity 12.05% and yield 1215 Kg/ha). The average economic gross return and cost benefit ratio is also higher in refined technology (T<sub>3</sub>) was Rs 65180 /ha and 1:2.56 followed by treatment (T<sub>2</sub>) Rs 48235 and 1:1.83 as compared with farmers practices Rs 36930 and 1: 1.73.

#### Keywords

White Rust  
*Albugo candida*,  
Mustard,  
*Brassica juncea*

#### Article Info

Accepted:  
25 September 2020  
Available Online:  
10 October 2020

### Introduction

In India, oilseed *Brassica* are grown over an area of about 6.3 million hectares with an annual production of 7.4 million tones with an average yield of 1304 kg/ha whereas in Rajasthan it was still 1422kg/ha (2016-17). The severe attack of many diseases not only

deteriorates the quality of the seed, but also reduces the oil content considerably. Among the diseases, white rust caused by *Albugo candida* (Pers. Ex Hook) O. Kuntze, is an important disease of a wide variety of *Brassica* crops. White rust caused by *Albugo candida* Kuntze have been reported to be most wide spread and destructive fungal diseases of

rapeseed mustard throughout the world (Kolte, 1985). It grows fast when favorable climatic minimum temperature of 15-16°C maximum temperature of 28-29°C and average relative humidity of more than 65% existed (Sangeetha and Siddaramaiah, 2007).

Its infection causes disfiguring white pustules on leaves, flowers stems and pod leading to yield losses 23 to 54.5 per cent from India (Saharan *et al.*, 1984 and Saharan, 1991) due to both phases (leaf and stag head) and 17-34 per cent (Yadav *et al.*, 2014). Mustard is an economically important crop in Alwar district of Rajasthan more than 2.5 lac ha area is under mustard cultivation.

Management technology recommended for white rust disease has not been much effective because farmers provide frequent irrigations (4-6) through sprinkler irrigation along with higher seed rate leads to dense plant population. Hence, looking for improved disease management technology. So, there is a need of assessment and refinement in technology through on-farm testing.

### Materials and Methods

The study was carried out in an operational area of Krishi Vigyan Kendra (ICAR-DRMR), Gunta Bansur, Alwar II, Rajasthan. Refinement of technology through on-farm testing was conducted in Rabi season 2014-15 and 2015-16 among the 5 different farmers' fields in each year. Selected in different villages of KVK (ICAR-DRMR) Gunta-Bansur situated at 76.3512220E longitude and 27.6839060 N latitude. All the farmers were trained on various aspects of mustard crop production and insect pest and disease management.

The observations on the progress of disease were recorded from the beginning of the first symptoms appear on leaves at farmers' fields. In each farmer's field five plants were selected

randomly, labeled and white rust intensity was recorded at seven days interval starting from the date of sowing on leaves using 0 - 5 scale as described below.

The Percent Disease Index (PDI) was calculated using the formula (Wheeler, 1969).

$$PDI = \frac{\text{Sum of individual rating}}{\text{Number of leaves examined} \times \text{Maximum disease grade}} \times 100$$

Scale Description of the symptom	
0	Leaves free from infection
1	Small white raised rust pustules covering <5% leaf area
2	Small white raised rust pustules covering 5.1-10% leaf area
3	Small white raised rust pustules join together covering 10.1-25% leaf area
4	Small white raised rust pustules join together to form irregular patches covering 25.1-50% leaf area
5	Small white raised rust pustules join together to form irregular large patches covering <50% leaf area

T<sub>1</sub> = Late sowing, no seed treatment and frequent irrigation (4-6) by sprinkle

T<sub>2</sub> = Seed treatment with metalaxyl 35 SD @ 6g/kg seed and foliar sprays of mancozeb @ 3g/l of water

T<sub>3</sub> = Seed treatment with metalaxyl 35% SD @ 6g/kg of seed and foliar spray of metalaxyl 8% + mancozeb 64% (1<sup>st</sup> at 35-40 DAS and 2<sup>nd</sup> spray 65-70 DAS) with 3-4 irrigation through sprinkle.

To know the effect of different treatments on crop yield, thousand seed weight, oil content and cost-benefit ratio. The harvest from various treatments were separately harvested and threshed and average yield per hectare and cost-benefit ratio were calculated. The seed obtained from each treatment was also analyzed for oil content with standard chemical methods.

### Results and Discussion

#### Symptoms

There are two types of infection were observed on different plant parts such as leaves, stem and inflorescence, first localized

infection of white rust disease on leaves and second Systemic infection on inflorescence. At farmers' fields in natural conditions symptoms was observed as early as 35-40 DAS mostly under surface of the lower leaves in the form of small creamy white spot either singly spot at one place or many small spot at many places on same leave depending upon the soil moisture and relative humidity of the environment.

Systemic infection results in abnormal growth and distortion of inflorescence and sterility of flowers, commonly called stag head formed as a result of hypertrophy and hyperplasia. The epidemic development of white rust caused by *A. candida* is dependent upon many factors, viz. aggressiveness of race, amount of available initial inoculums, time of first appearance of the disease and prevailing weather conditions. *A. candida* isolates from different Brassica species/cultivar or from different geographical regions may be different in their incubation period, latent period and production of sporangia and zoospores, pustule size, shape and texture and aggressiveness (Lakra and Saharan, 1988; Gupta and Saharan, 2002; Patni *et al.*, 2005 and Mishra *et al.*, 2009).

Spot also in ring form. When disease advanced the spot are collapsed together. The whole leaves appeared as white pustules of *Albugo candida*. The symptoms also appear on stem or pod when disease appears earlier in field. In mixed infection of white rust and downy mildew is common on stage heads

#### **Effect of different treatments on white rust severity**

The assessment and refined of technology showed that the treatment T<sub>3</sub> i.e. seed treatment with Metalaxyl 35% SD @ 6g/Kg of Seed and foliar spray of Metalaxyl 8% + Mancozeb 64% (1<sup>st</sup> at 35-40 DAS and 2<sup>nd</sup> spray 65-70 DAS) along with timely sowing and 3-4 irrigation through sprinkle during the

crop season recorded minimum disease severity (8.25%) and maximum disease control 31.5 per cent followed by treatment T<sub>2</sub> (i.e. seed treatment with Metalaxyl 35 SD @ 6g/kg seed and foliar spray of Mancozeb @ 3g/l of water) was disease severity (9.65%) and disease control 19.92 per cent as compare to farmers practices in which disease severity was 12.05 per cent.

#### **Seed yield and cost benefit ratio**

Mean of 2 years data on seed yield and cost benefit ratio presented in table 2 showed that the maximum seed yield (1875 Kg/ha) was obtained in treatment T<sub>3</sub> i.e. metalaxyl 35% SD @ 6g/kg of Seed and foliar spray of Metalaxyl 8% + Mancozeb 64% which was 54.3% higher seed yield as compare to farmers practices (1215 Kg/ha) followed by treatment T<sub>2</sub> (seed treatment with Metalaxyl 35 SD @ 6g/kg seed and foliar spray of Mancozeb @ 3g/l) the seed yield was 1400.0 Kg/ha.

The average economic gross return and cost benefit ratio is also higher in refined technology (T<sub>3</sub>) was Rs 65180 /ha and 1:2.56 followed by treatment (T<sub>2</sub>) Rs 48235 and 1:1.83 as compared with farmers practices Rs 36930 and 1: 1.73. The result was collaborated with result of Abhishek *et al.*, (2014).

#### **Effect of different treatments on 1000 seed weight and oil contents**

Maximum 1000 seed weight was 5.2g and oil content (39.6%) were recorded in treatment T<sub>3</sub> followed by treatment T<sub>2</sub> (4.8g and 38.3%) and minimum recorded in Farmers practices (3.88g and 37.2%) (Table 3). The finding was collaborated with Bains and Jhooty (1979) reported losses in *B. juncea* from 37-47% and 17-32% reduction in siliquae formation and seed production respectively due to mixed infection of DM and white rust.

**Table.1** Effect of different treatments on the White rust severity at farmers' fields during the year 2014-15 and 2015-16

Treatments	Disease severity (%)			Disease control over Farmer practices (%)
	2014-15	2015-16	Mean	
<b>T1</b> : Farmers practices: Late sowing, no seed treatment and frequent irrigation by sprinkle	12.6	11.5	12.05	-
<b>T2</b> : Recommended practice: Seed treatment with Metalaxyl 35 SD and FS Mancozeb @ 3g/l	9.2	10.1	9.65	19.92
<b>T3</b> : Refinement in technology: Timely sowing + ST and FS of Metalaxyl 8%+ Mancozeb 64% @ 2g/l	8.4	8.1	8.25	31.5
<b>CD at (0.05)</b>			1.69	
<b>CV</b>			11.58	

**Table.2** Effect of different treatments on seed yield and cost benefit ratio of mustard at farmer field

Treatments	Yield (Kg/ha)			Mean Yield increases Over FP (%)	Av.Cost of Cultivation( Rs/ha)	Av. Gross return (Profit) Rs./ha	Av. Net Return	B:C Ratio
	2014-15	2015-16	Mean					
<b>T1</b>	1200	1215	1250	-	21370	36930	15560	1:1.73
<b>T2</b>	1420	1380	1400	15.7	26370	48235	21865	1.1.83
<b>T3</b>	1840	1910	1875	54.5	25470	65180	39710	1:2.56
<b>CD at(0.05)</b>			106.54		-			-
<b>CV</b>			4.88					

**Table.3** Effect of different treatments on 1000 seed weight and oil content in mustard seed at farmer field during the year 2014-15 and 2015-16

Treatments	1000 seed wt(g)			Oil content (%)		
	2014-15	2015-16	Av. Seed wt(g)	2014-15	2015-16	Av. Oil content
<b>T1:</b>	3.85	3.91	3.88	36.8	37.7	37.2
<b>T2:</b>	4.78	4.83	4.80	38.2	38.5	38.3
<b>T3 :</b>	5.21	5.20	5.20	39.5	39.8	39.6
<b>CV</b>			3.22			0.967
<b>CD at (0.05)</b>			0.217			0.542

Fig.1



PD Meena (2014) reported that on the 1000-seed weight, the per cent yield reductions were 46.8, 42.6 and 66.7 in cvs. Varuna, Rohini and NRCDR-2, respectively. Others workers have also reported 23-55% yield loss in *B. juncea* due to mixed infection with both pathogens (Saharan, 1992).

In conclusion the management technology recommended for white rust disease was seed treatment with Metalaxyl 35% SD @ 6g/Kg of Seed and foliar spray of Metalaxyl 8% + Mancozeb 64% (1<sup>st</sup> at 35-40 DAS and 2<sup>nd</sup> spray 65-70 DAS) along with timely sowing and 3-4 irrigation through sprinkle method was found to be effective in disease control with higher production of mustard with high oil content percentage.

### Acknowledgement

The authors are highly grateful to ICAR, ATARI II and Director, ICAR-Directorate of Rapeseed-Mustard, Sewar, Bharatpur to conduct On Farm Trail successfully at KVK.

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**How to cite this article:**

Sunil Kumar, Sushil Kumar Sharma, Pankaj Sharma and Rai, P. K. 2020. Study of White Rust (*Albugo candida*) Management Approach in Indian Mustard (*Brassica juncea*) at Farmers Fields through on farm Trail (OFT). *Int.J.Curr.Microbiol.App.Sci.* 9(10): 3916-3921.  
doi: <https://doi.org/10.20546/ijcmas.2020.910.451>