EVALUATION OF TEBUCONAZOLE 6% FS AGAINST COLLAR ROT, STEM ROT AND ROOT ROT DISEASE COMPLEX IN GROUNDNUT

Abstract

Groundnut regarded as "king of oil seed crops" is an economic important food legume and edible oilseed crop in India, which severely suffers from soil borne diseases of groundnut, collar rot (*Aspergillus niger*), stem rot (*Sclerotium rolfsii*) and root rot (*Rhizoctonia solani*) causing major havoc causes significant economic losses. The field experiments were conducted to find out the efficacy of Tebuconazole 6% FS as a seed treatment fungicide against collar rot, stem rot and root rot diseases complex in ground nut during *Rabi* 2014-15 and *Rabi* 2015-16. The treatment Tebuconazole 6% FS @ 4.0 ml/10 kg and Tebuconazole 6% FS @ 5.0 ml/10 kg of seeds were found be the best treatments for seed germination, root and shoot length in during both the seasons. During first season, Tebuconazole 6% FS @ 5.0 ml/10 kg of seeds and Tebuconazole 6% FS @ 4.0 ml/10 kg of seeds were recorded 1.77 and 2.14 per cent collar rot incidence, 3.07 and 4.23 per cent stem rot disease incidence and 4.93 and 5.05 per cent root rot disease incidence, respectively. Similarly during second season, Tebuconazole 6% FS @ 5.0 ml/10 kg of seeds and Tebuconazole 6% FS @ 4.0 ml/10 kg of seeds were recorded 1.89 and 2.06 per cent collar rot incidence, 4.05 and 5.13 per cent stem rot incidence and 5.74 and 5.94 per cent root rot incidence, respectively. The highest pod yield was obtained from seed treatment with Tebuconazole 6% FS @ 5.0 ml/10 kg of seeds i.e. 20.22 q/ha and 20.10 q/ha during first and second season, respectively and Tebuconazole 6% FS @ 4.0 ml/10 kg of seeds recorded 20.12 q/ha and 20.00 q/ha of pod yield during first and second season, respectively.

Keywords: Collar Rot, Groundnut, Root Rot, Stem Rot and Tebuconazole 6% FS

Introduction

"Groundnut (*Arachis hypogaea* L.) belongs to leguminaceae family is an economic important food legume and edible oilseed crop in India and" (Reddy, 1976). "It is an important source of oil for majority of human population of world and is a rich source of protein for human and animal consumption. Groundnut kernels contain 48-50 per cent of edible oil and 26-28 per cent protein, along with rich dietary fibre. It also contains 18 per cent carbohydrates and minerals like Ca, Mg and Fe in higher levels in an available form, vitamins B1, B2 and niacin are present in a considerable level" (Ntare *et al*., 2008). "Hence, groundnut is popularly known as "poor man's badam". After extraction of the residual oil, the groundnut cake contains high nitrogen (7.0-8.0%) and other nutrients are also good source of organic

manure which is used both in fertilizer and cattle feed. Globally, the groundnut crop grown with an annual production of 53.6 million tons from an area of 31.6 million hectares in 2020 season" (Anon., 2022). "Nearly 30.19 M ha area in the world is dedicated to groundnut production whereas, in India it is 6.0 M ha with a production of 6.7 MMT" (Anon., 2021). "In India, though groundnut is cultivated in one or more seasons (*Kharif* and *Rabi* and summer) but nearly 80 per cent of the annual acreage and production comes from *Kharif* crop (June to October) season. This crop is primarily grown on a commercial scale in more than 82 countries in the world, including India. In India, the total coverage area under groundnut is about 6.09 million hectares and production is of 10.21 million tonnes with average productivity of 1676 kg/hectare" (Anon., 2020a). "The major groundnut-growing states are Gujarat, Andhra Pradesh, Telangana, Tamil Nadu, Karnataka, Rajasthan, and Maharashtra. These states constitute approximately 80% of India's area and are responsible for approximately 80 per cent of the country's groundnut production" (Anon., 2020b).

"One of the most important factors contributing to the low yield is the diseases affecting the crop. The yield is declining due to several factors such as disease incidence, uncertain environmental conditions, low input applications and unavailability of high yielding as well as disease resistant varieties. The groundnut cultivation is often subjected to significant yield losses annually due to biotic and abiotic stresses and are the major limiting factors for attaining high productivity in India. Among various biotic stresses, soilborne and foliar diseases account for reduced pod yields" (Vineela *et al*., 2018). "A large number of diseases attack to groundnut in India and causes severe damage during any stage of crop growth, and yield losses over 25 per cent have been reported" by Mayee and Datar (1988). "Groundnut is a crop which is severely suffers from more than 70 diseases due to fungi, bacteria, viruses, nematodes, etc., (Grover, 1981) which attack the crop at various stages of growth and cause severe considerable yield losses, and in some cases impairing quality and estimated yield loss to be up to 70 per cent" (McDonald *et al*., 1985; Lukose *et al*., 2008). "The diseases mainly incited by fungi, which takes heavy toll of the crop at all the stages of growth right from sowing to harvest and storage such as early leaf spot (*Phaeoisariopsis arichidicola*), late leaf spot (*Phaeoisariopsis personata*), rust (*Puccinia arichidis*), collar rot (*Aspergillus niger*), stem rot (*Sclerotium rolfsii*), root rot (*Rhizoctonia solani*), and afla root (Aspergillus flavus). Soil borne diseases *viz*., stem rot, collar rot and root rot are the major potential prevalent diseases of groundnut and threat to groundnut cultivation in India" (Faujdar and Oswalt 1992). "Among the soil borne diseases of groundnut, diseases such as collar rot (*Aspergillus niger*), stem rot (*Sclerotium rolfsii*), root rot (*Rhizoctonia solani*), are

causing major havoc in all crop growing areas causes significant economic losses". (Jadon et al., 2015) "The collar rot (*Aspergillus niger*) of groundnut is an important seed and soil borne disease which reduce the germination by rotting of seeds and early mortality of seedling" (Rakholiya *et al*., 2012). "Annual world yield losses by the disease are more than 10 per cent and fungus is prevalent in soils with the low moisture and approximately 30°C temperature" (Karthikeyan 1996, Kucuk and Kivank 2003). "The maximum disease incidence (25-50%) was reported in Rajasthan" (Kishore *et al*., 2006). "The loss due to collar rot disease was reported 28 to 50 per cent" (Bakhetia, 1983). Among all diseases, stem rot is reported to cause losses in yield up to 25 per centt (Mayee and Datar, 1988) and collar rot up to 40 per cent in India (Chohan and Singh, 1973). The losses may amount to 40-50 per cent in terms of mortality of crop (Aulakh and Sandhu, 1970) particularly in *kharif* groundnut when the climatic conditions are more favourable for pathogen. "The stem rot of groundnut causes 13 to 59 per cent yield loss during both the rainy and summer seasons" (Nautiyal, 2002). "The root rot pathogen causes yield losses to an extent of 80 per cent depending on the stage of the crop" (Sen, 2000).

"Although some plant diseases may be managed through resistant varieties and alteration of cultural practices, some diseases are only managed effectively with the application of suitable fungicides. Several diseases are only managed acceptably with the application of a suitable fungicide" (Thind, 2008). "The conventional method to control the diseases in groundnut crop is fungicide application" (Gangopadhyay *et al*., 1996; Nutsugah *et al*. 2007; Rakholiya *et al*., 2012). "Among various methods, fungicides serve as important tools for managing diseases in agricultural crops. A convenient means of applying crop protection treatments involves treating the seed. Seed treatments can be particularly useful, since they can provide protection to young plants during a vulnerable stage in their development" (Walters *et al*., 2013). "Fungicide seed treatment appears to be economically feasible and relatively safer method for controlling both seed and soil-borne plant pathogens" (Agarwal and Sinclair, 1987). "Fungicides may eradicate pathogens in seeds and can also protect seeds and seedlings from soil-borne pathogens" (Maude, 1996). "Both systemic and non-systemic fungicides can be used as seed treatment for effective management of soilborne diseases. Collar rot and stem rot are reported to cause damage in early stage to late stage of crop growth. Whereas, root rot symptom noticed only at late stage of crop. Therefore an effective management of crop is required from seedling stage which can be assured only by seed treatment. Fungicide seed treatment is a cheap insurance for peanut seed producers and growers. Correct fungicide use can contribute to better performance of the propagation

material, increasing the yield" (Zhang *et al*., 2001). "There are several reports indicated that groundnut stem rot and collar rot can be managed by seed treatment with fungicides like thiram, carbendazim" (Divya *et al*., 2012) "Many seed dressing fungicides are reported to be effective against collar rot of groundnut" (Bhatia and Gangopadhyay, 1996; Karthikeyan, 1996). "Few triazole fungicides such as propiconazole and difenoconazole have been recommended to manage the disease successfully" (Brenneman *et al*., 1994 and Cilliers *et al*., 2003). Rakholiya and Jadeja (2009) "spray application of fluchloraline @ 1.5a.i.kg/ha seed treatment with Vitavax + Thiram @ 3.0g/kg seeds was also reported to be effective against stem rot of groundnut". "Seed treatment with thiram or captan has been found effective for the control of both pre-immergence and post emergence phases of groundnut" (Agnihotri and Sharma, 1972). "Soilborne disease can be managed by seed treatment with both non-systemic and systemic chemical fungicides like companion, bavistin, vitavax power, steam, raxil and kavach" (Rathod *et al*., 2010; Rakholiya *et al*., 2012; Nandeesha *et al*., 2013; Srinivasan and Kannan, 2015; Kumari *et al*., 2016; Rakesh *et al*., 2017). Looking to the losses due to these diseases, field testing of fungicides were necessary as a seed treatment to find out effective seed dresser fungicide for control soilborne diseases. Hence, field experiments were conducted to find out the efficacy of Tebuconazole 6% FS as a seed treatment fungicide against collar rot, stem rot and root rot diseases complex in ground nut

Materials and method:

Field experiments were conducted to know the efficacy of Tebuconazole 6% FS as a seed treatment fungicide against collar rot, stem rot and root rot diseases complex in ground nut at farmer field in Eachanal village in the jurisdiction of Agricultural Extension Education Centre, Lingsugur, during *Rabi* 2014-15 and *Rabi* 2015-16. The popular groundnut variety TMV-2 was sown in plot size of 5 m x 4 m with 30 cm X 10 cm spacing on 19.11.2014 and 05.11.2015, respectively. Experiment was laid out in Randomized Block Design with six treatments and four replications with a control. The fungicide was applied as seed treatment on 19.11.2014 during *Rabi* 2014-15 and on 05.11.2015 during *Rabi* 2015-16 and the treated groundnut seeds with respective fungicides were sown in the replicated plots. Groundnut seeds were treated with different dosages of fungicides as mentioned in the treatment details given below. To ensure uniform coating of seed adequate quantity of fungicide was taken in a closed container and the seed were rolled until each grain was uniformly coated with the fungicide. All other agronomical practices were followed as per university package of practices for the *Rabi* cultivation. Treatments were as follows

T1 - Tebuconazole 6% FS @ 3.0ml/10 kg of seeds; T2 - Tebuconazole 6% FS @ 4.0 ml/10 kg of seeds; T3 - Tebuconazole 6% FS @ 5.0 ml/10 kg of seeds; T4 - Tebuconazole 2% DS @ 12.5g/10 kg of seeds; T5 - Carbendazim 50% WP @ 20.0g/10 kg of seeds; T6 - Untreated control

The plots were inspected regularly to see the germination and the percentage of germination of seeds was recorded for each treatment based on the formula

$$\text{Germination (\%)} = \frac{\text{No. of germinated seedling}}{\text{Total no. of seeds sown in that plot}} \text{ X } 100$$

To judge the effect of Tebuconazole 6% FS on the seedling vigor, the particular growth stages of ground nut plants were considered (i.e. 30 days after seed sowing) during both seasons. Seedling vigor was measured by following standard formula given by International seed Testing Association (ISTA, 1986)

$$\text{Vigor Index} = (\text{Root length} + \text{Shoot length}) \times \text{Germination (\%)}$$

After 30 days of treatment, various morphological parameters such as per cent germination, root length, shoot length were also measured. The incidence of collar rot, stem rot and root rot were recorded and efficacy of molecule in controlling of these diseases was observed in each replicated plot for each treatment. The number of healthy and infected plant were counted in each treatment and per cent disease incidence and per cent disease control were calculate using the following formula (Kokalis Burelle *et al*., 1992).

$$\text{Disease Incidence (\%)} = \frac{\text{No. of affected seedlings}}{\text{Total No. of seedling observed}} \text{ X } 100$$

In order to record the yield, at maturity crop was harvested from the individual replicated plots on 20.04.2015 and 23.03.2016 during *Rabi*, 2014-15 and *Rabi*, 2015-16, respectively. Average pod yield per plot was recorded after allowing the pods to dry in sun for ten days after the harvest and converted into q/ha. All the data were statistically analyzed (Gomez and Gomez, 1984).

Results and Discussion:

Germination:

The seed treatment with Tebuconazole 6% FS @ 4.0 and 5.0 ml/ 10 kg of seeds recorded increased seed germination significantly i.e. 91.50 and 92.25 per cent, respectively as compared to untreated control (83.50%) and other standard checks during first seasons (Table 1). Similarly, during second season Tebuconazole 6% FS @ 4.0 and 5.0 ml/ 10 kg of seeds recorded the highest i.e. 87.90 and 88.89 per cent, seed germination, respectively which

was found superior than the untreated control (75.70%) and other standard check treatments (Table 2). It was found that seed germination percentage in Tebuconazole 6% FS treatments @ 4.0 ml/10 kg of seeds was at par with Tebuconazole 6% FS @ 5.0 ml/10 kg of seeds during both the seasons. All the treatments were found to be significantly superior with respect to control.

Root length and Shoot length:

Similar trends like germination were also observed in root and shoot length which further reflected in vigor index. The seed treatment with Tebuconazole 6% FS @ 4.0 and 5.0 ml/ 10 kg of seeds recorded significantly higher root length and shoot length as compared to untreated control as well as other standard checks during both the seasons (Table 1 & 2). All the treatments were found to be significantly superior with respect to control. It has found that root and shoot length in Tebuconazole 6% FS treatments @ 4.0 ml/10 kg of seeds was at par with Tebuconazole 6% FS @ 5.0 ml/10 kg of seeds during both the seasons.

Collar rot disease:

Among the treatments, Tebuconazole 6% FS @ 5.0 ml/10 kg of seeds and Tebuconazole 6% FS @ 4.0 ml/10 kg of seeds were found to be the best treatments as there were 1.77 and 2.14 per cent collar rot incidence in Ground nut were recorded as compared to 6.56 per cent collar rot incidence in untreated control during first season (Table 1). The effect of seed treatment on collar rot control with Tebuconazole 6% FS @ 5.0 ml/10 kg of seeds and Tebuconazole 6% FS @ 4.0 ml/10 kg of seeds were statistically at par with each other. Similar trend was also observed during the second season where Tebuconazole 6% FS @ 5.0 ml/10 kg of seeds recorded 1.89 per cent disease incidence which was at par with Tebuconazole 6% FS @ 4.0 ml/10 kg of seeds (2.06 %) (Table 2). All the treatments were significantly superior to control recorded 7.38 per cent incidence of collar rot. This finding collaborate with the finding of earlier workers Meena and Gangwar (2011) reported that five fungicides used as seed treatments were evaluated against collar rot of groundnut and found that vitavax power (carboxin 37.50% + thiram 37.50%) @3.0g/kg seed was found minimum diseases incidence and obtained maximum pod yield. Similar results were also obtained by Shivpuri Asha *et al*. (2011). This finding collaborates with the finding of earlier workers Kumari *et al*. (2016).

Stem rot disease:

In the first season, stem rot disease incidence in the treatment of Tebuconazole 6% FS @ 5.0 ml/10 kg of seeds was found 3.07 per cent which was on par with Tebuconazole 6% FS @ 4.0 ml/10 kg of seeds (4.23 %) and these treatments were significantly superior to all

other treatments (Table 1). Similar trend was also observed in the second season where Tebuconazole 6% FS @ 5.0 ml/10 kg of seeds recorded the lowest incidence of stem rot disease (4.05 %) and was on par with Tebuconazole 6% FS @ 4.0 ml/10 kg of seeds (5.13 %) (Table 2). Maximum stem rot incidence i.e. 20.46 and 22.22 per cent were recorded on untreated control treatment during first and second season, respectively. Findings with respect to disease management of stem rot under field condition by use of fungicides were well endorsed by earlier workers (Ray and Das, 1987; Brenneman *et al*., 1994). Brenenman *et al*. (1994) who tested the effect of propiconazole and reported that the fungicide could be used effectively for the management of stem rot of groundnut. The present result are in agreement with the results obtained by Adiver and Anahosur (1995), who reported that triazole group of fungicides i.e., tebuconazole and cyperconazole were effective against colonization of *Sclerotium rolfsii.* The present result corroborated the finding of Bowen *et al.* (1997) who reported that incidence of southern stem rot (*S. rolfsii*) was inversely related to number of tebuconazole applications, while yield was directly related to number of tebuconazole applications. Similarly Nath *et al*. (2013) reported that tebuconazole (0.15%) gave best result and increased yield up to 67 per cent as compared to 39 per cent increase by tebuconazole (0.10%). The effectiveness was probably due to mode of action of tebuconazole (Bhagwan, 2010), which exhibited directional selection process in pathogen, indicating the resistance mechanism may be under the influence of many genes, or at least more than one (Franke *et al*., 1998). This result is consistent with that of Karnsrang (2002) who reported that groundnut seed treatment with mancozeb effectively controlled root rot pathogens such as *A. niger* and *S. rolfsii* and increased seed germination and seedling vigour.

Root rot disease:

Root rot disease incidence during first season was lowest in the treatment of Tebuconazole 6% FS @ 5.0 ml/10 kg of seeds was found 4.93 per cent which was on par with Tebuconazole 6% FS @ 4.0 ml/10 kg of seeds (5.05 %) and these treatments were significantly superior to all other treatments (Table 1). Similar trend was also observed in the second season where Tebuconazole 6% FS @ 5.0 ml/10 kg of seeds recorded the lowest incidence of Root rot disease (5.74 %) and was on par with Tebuconazole 6% FS @ 4.0 ml/10 kg of seeds (5.94 %) (Table 2). Maximum Root rot incidence i.e. 10.56 and 13.99 per cent were recorded on untreated control treatment during first and second season, respectively. Tebuconazole alone, has also been reported to be effective in managing root rot caused by *Rhizoctonia solani* in groundnut (Meena and Chatopadhyay, 2002). Tebuconazole is a broad-spectrum, systemic fungicide that may be used to manage soilborne

Basidiomycetes such as *R. solani* and *S. rolfsii* (Brenneman, 1997; Brenneman *et al.*, 1994; Backman and Brenneman, 1997; Baird *et al.*, 1991). Azoxystrobin and tebuconazole also display activity against *R. solani* (Csinos, 1987).

Ground nut pod yield:

The result presented in the table 1 and 2 showed that highest pod yield was obtained from seed treatment with Tebuconazole 6% FS @ 5.0 ml/10 kg of seeds i.e. 20.22 q/ha and 20.10 q/ha during first and second season respectively which was also at par with Tebuconazole 6% FS @ 4.0 ml/10 kg of seeds recorded 20.12 q/ha and 20.00 q/ha of pod yield during first and second season respectively. All the treatments were significantly superior with respect to control (Table 1 and 2). Minimum pod yield i.e. 14.96 q/ha and 15.00 q/ha were recorded on untreated control treatment during first and second season, respectively. Dandnaik *et al*. (2009) reported that seed treatment with hexaconazole gave higher pod yield in ground nut. Rakholiya *et al*. (2012) studied fungicides namely vitavax, carboxin, ipconazole, thiram and mancozeb in field condition and reported that collar rot disease incidence was minimum (5.16%) and maximum pod yield (1232 kg/ha) were recorded in the treatment of vitavax 200 WP 4.0 g/kg seed followed by Propiconazole at Junagarh. Seed treatment with tebuconazole @ 1.5 g/kg seed, mancozeb @ 3 g/kg seed and carbendazim + mancozeb @ 3 g/kg seed were very effective in management of soil borne diseases of groundnut and these treatments were also exhibited good yield (Jadon *et al*., 2015). Dandnaik *et al*. (2009) reported that hexaconazole as seed treatment showed the highest seed germination of 75%. Sharma and Gour (2009) noted that seed treatment with carbendazim and propiconazole also resulted in increased germination and seedling vigor of pea. Bittencourt *et al*. (2007), evaluated the efficiency of carboxin + thiram and the viability of the use of vegetable oil and an organo-sillicone based surphactant as fungicide vehicle for seed-borne fungi control. Similarly several other workers also reported the efficacy of tebuconazole under field conditions in reducing the stem rot incidence. Triazoles such as tebuconazole, cyperconazole and difeniconazole provide excellent control of some soil borne diseases. Fungicides belonging to trialzoles group inhibit biosynthesis of ergosterol which plays an important role in structure of cell membrane of fungi (Dahmen, *et al*., 1988; Waterfield and Sisler, 1989). These fungicides have systemic character and can penetrate the inside of seed and can be used as seed treatment and applied to green plants safely (Sundin *et al*., 1999).

Conclusion

The Seed treatment of Tebuconazole 6% FS @ 4.0 – 5.0 ml/10 kg of seeds were effective in control of Collar rot, Stem rot and Root rot disease incidence during both the seasons tested and resulting higher root length, shoot length, vigor index and pod yield of Ground nut. Tebuconazole 6% FS @ 4.0 ml/10 kg of seeds and Tebuconazole 6% FS @ 5.0 ml/10 kg of seeds were found on par at all the parameters. There was no any phyto-toxicity symptoms were noticed at recommended as well as higher doses of Tebuconazole 6% FS. Hence, it can be concluded that Tebuconazole 6% FS @ 4.0 ml/ 10 kg of seeds is effective in managing the Collar rot, Stem rot and Root rot diseases of Ground nut without any harmful effect on crop.

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Table 1: Efficacy of Tebuconazole 6% FS on Germination, Vigor index, Disease incidence and Yield of Groundnut during *Rabi* 2014

Treatments	Dose (per 10 kg of seeds)		Seed germination (%)	Shoot length (cm)	Root length (cm)	Vigor Index	% Incidence of diseases			Pod Yield (Q/ha)
	Formulations (g or ml)	g a.i.					Collar rot	Stem rot	Root rot	
Tebuconazole 6% FS	3.0	0.18	87.25	16.38	7.72	2102.7	3.60 (10.94) *	8.77 (17.22)	6.67 (14.97)	17.86
Tebuconazole 6% FS	4.0	0.24	91.50	19.26	9.22	2605.9	2.14 (8.41)	4.23 (11.87)	5.05 (12.99)	20.12
Tebuconazole 6% FS	5.0	0.30	92.25	19.75	9.72	2718.6	1.77 (7.63)	3.07 (10.09)	4.93 (12.83)	20.22
Tebuconazole 2% DS	12.5	0.25	88.00	17.05	8.22	2223.8	4.67 (12.47)	7.43 (15.82)	6.97 (15.31)	18.00
Carbendazim 50% WP	20.0	10.0	87.50	16.75	7.72	2141.1	5.07 (13.00)	12.97 (21.11)	8.26 (16.70)	17.95
Untreated control	-	-	83.50	14.32	7.00	1780.2	6.56 (14.84)	20.46 (26.89)	10.56 (18.96)	14.96
CD (0.05)	**--**	**--**	**1.51**	**1.38**	**0.82**	**-**	**2.17**	**1.83**	**2.00**	**1.13**

*Data in the parenthesis is angular transformed value

Table 2: Efficacy of Tebuconazole 6% FS on Germination, Vigor index, Disease incidence and Yield of Groundnut during *Rabi* 2015

Treatments	Dose (per 10 kg of seeds)		Seed germination (%)	Shoot length (cm)	Root length (cm)	Vigor Index	% Incidence of diseases			Pod Yield (Q/ha)
	Formulations (g or ml)	g a.i.					Collar rot	Stem rot	Root rot	
Tebuconazole 6% FS	3.0	0.18	84.20	15.78	7.50	1960.3	3.49 (10.77) *	10.17 (18.70)	8.54 (16.99)	18.04
Tebuconazole 6% FS	4.0	0.24	87.90	17.78	8.55	2314.6	2.06 (8.25)	5.13 (13.09)	5.94 (14.11)	20.00
Tebuconazole 6% FS	5.0	0.30	88.89	17.82	8.68	2355.6	1.89 (7.81)	4.05 (11.61)	5.74 (13.86)	20.10
Tebuconazole 2% DS	12.5	0.25	81.10	15.28	7.71	1864.7	3.42 (10.66)	9.13 (17.59)	7.50 (15.90)	18.15
Carbendazim 50% WP	20.0	10.0	80.00	15.78	7.46	1859.4	5.89 (14.05)	14.67 (22.51)	8.92 (17.38)	17.75
Untreated control	-	-	75.70	13.53	7.05	1558.1	7.38 (15.76)	22.22 (28.12)	13.99 (21.97)	15.00
CD (0.05)	**--**	**--**	**2.19**	**1.66**	**0.67**	**-**	**2.08**	**2.22**	**1.86**	**1.71**

*Data in the parenthesis is angular transformed value