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Evaluation of fungicides and botanicals against major seed borne fungi of groundnut

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Abstract
Groundnut (*Arachis hypogaea* L.) crop is attacked by a various seed and soil borne fungal pathogen as well as other pathogen, under field condition as well as during storage, causing economical losses. Therefore present *in vitro* investigation was planned to assess the efficacy of five fungicides and five botanicals against major seed borne fungi of groundnut. The present investigation result revealed that all the fungicides and botanicals exhibited significant mycelial growth inhibition of six major seed borne fungi viz., *Aspergillus flavus, Aspergillus niger, Fusarium oxysporum, Rhizoctonia bataticola, Sclerotium rolfsii* and *Alternaria alternata* of groundnut. However, the fungicides viz., Carbendazim 50% WP, Carbendazim 12% + Mancozeb 63% WP, Carboxin 37.5% + Thiram 37.5 % WS, Captain 70% + Hexaconazole 5% and Thiophanate methyl 450 g/l + Pyraclostrobin 50 g/l FS and botanicals viz., *Azadirachta indica* (Leaf extract), *Allium sativum* (Clove extract), *Ocimum sanctum* (Leaf extract),*Curcuma longa* (Rhizome extract) and *Zingiber officinale* (Rhizome extract). Result revealed from fungicides 100 per cent growth inhibition of *Aspergillus flavus, A. niger, Fusarium oxysporum, Rhizoctonia bataticola* and *Sclerotium rolfsii.* Among the botanicals *Allium sativum* (Clove extract) showed 100% growth inhibition in all pathogens. Rests of botanicals also were found effective.

Keywords: Evaluation, fungicides, botanicals, fungi, groundnut

Introduction
Groundnut (*Arachis hypogaea* L.) or peanut is a self-pollinated annual legume crop and it originated from South America. It is also called as "King of oil seeds", widely grown for its high quality edible oil and food use in the tropical and warm temperate regions of the world. The crop is grown in more than 100 countries. The major groundnut producers are China, India, Nigeria, USA, Senegal, Myanmar, Indonesia, Burma and Sudan. Groundnut is adapted to varying agro-climatic conditions and soils. It is primarily grown in rainy (*Kharif)* under rainfed conditions in India, which accounts for 83% of the total area under the crop in the country. The remaining 17% of the area is cultivated mostly in the post rainy (Rabi/ summer) season with irrigation or on residual soil moisture.

Groundnut contain in an average 45-50 per cent oil, 40.1 per cent of fat and 26-28 per cent of protein and it is the rich source of calcium, iron, and vitamin B complex like thiamine, riboflavin, niacin and vitamin A. It is used not only as a major cooking medium for various food items but also for manufacture of soaps, cosmetics, shaving creams and lubricants. The groundnut finds extensive use as cooking medium both as refine oil and vanaspati ghee. Kernels are also eaten raw, roasted or sweetened. They are rich in protein and vitamins A, B and some member of B_2 group. Their calorific value is 349 per 100g. The residual oil cake contains 7 to 8 percent of N, 1.5 percent of P_2O_5 and 1.2 percent of K_2O and is used as a fertilizer. It is an important protein supplement in cattle and poultry rations. It is also consumed as confectionary product. The cake can be used for manufacturing coarse board, cork substitutes etc. Groundnut is also of value as rotation crop. Being a legume with root nodules, it can synthesis atmospheric nitrogen and therefore improve soil fertility (Kakde *et al*., 2012) [6].

Materials and Methods
Isolation of seed borne fungi of groundnut
The seed samples of groundnut varieties TAG-24, AK-159, AK-335, AK-303, Kopargaon and Local were collected from different places i.e. Oilseed Research Station, Dr. PDKV, Akola,

College of Agriculture, Nagpur and from local market. Detection of seed borne mycoflora from groundnut by using standard blotter paper, 2,4–D blotter paper and agar plate method. Observation was taken under stereoscopic microscope, distinguishes on the basis of colony colour and growth habit, further re-isolated on fresh PDA plates and incubated at room temperature. Based on morphological characteristics and microscopic observations, the most predominant fungi identified were *Aspergillus flavus, Aspergillus niger, Fusarium oxysporum, Rhizoctonia bataticola, Sclerotium rolfsii and Alternaria alternata*

Preparation of plant extract

Proportion used fresh plant materials (leaf, clove and rhizome) were washed separately with fresh water and finally with sterilized water. They were grind with in mortar and pestle with sterile water at the rate of one ml/g. The extract was obtained by squeezing the macerate with cotton wool. It was strained through muslin cloth, finally through Whatman no.1 filter paper and passed through seitz filter to free it from bacterial contaminants. This formed a standard plant extract solution (100%) and stored in refrigerator for further used.

***In vitro* evaluation of fungicides and botanicals**

Five different fungicides and five different botanicals were evaluated against seed borne fungi of groundnut by poison food technique. The desired concentration was obtained by adding appropriate amount of fungicides/botanicals in PDA medium and replicates thrice. PDA without fungicides or botanicals served as control. Each plate was inoculated with a 5 mm mycelial disc of pathogen taken from the seven day old culture. The plate was incubated at 27 ± 2^0C and radial mycelial growth of pathogen was measured at 7 days after inoculation. The diameter of the colony of the pathogen was measured in both direction and average was recorded and the percent inhibition of growth of the test pathogen was calculated by using formula (Vincent, 1947) [15].

Per cent inhibition = C – T / C × 100

Where,
C = Growth of mycelial in control (mm)
T = Growth of mycelial in treatment (mm)

Result and Discussion

Effect of fungicides and botanicals on radial mycelial growth of *Aspergillus flavus*

The result (Table 1) revealed that there was significant difference due to various treatments of fungicides against *Aspergillus flavus* on 7th DAI over inoculated control, under *in vitro* condition by poison food technique. The radial mycelia growth of tested organism was found 100% in inhibition in (T2) carbendazim + mancozeb over control and (T3) carboxin + thiram 87.30%, (T4) captan + hexaconazole 86.51%, (T1) carbendazim 82.94% and (T5) thiophanate methyl + pyraclostrobin 79.36%, inhibition over control. Among the botanicals (T7) *Allium sativum* showed 85.32% inhibition of *Aspergillus flavus* at 10% concentration, whereas rest of botanicals showed least effective.

Effectiveness of carbendazim + mancozeb (100%) inhibition growth of *Aspergillus flavus* over control reported by Wani and Kuruchave (2004) [16] similarly carbendazim + mancozeb, carbendazim, carboxin + thiram inhibition of colony growth of tested pathogen was earlier reported by Bansal and Sobti (1988) [2].

Effect of fungicides and botanicals on radial mycelial growth of *Aspergillus niger*

The result (Table 1) revealed that there was significant difference due to various treatments of fungicides against *Aspergillus niger* on 7th DAI over inoculated control, under in vitro condition by poison food technique. The radial mycelia growth of tested organism was found 100% in inhibition in (T1) carbendazim, (T2) carbendazim + mancozeb and (T3) carboxin + thiram over control.

Remaining two fungicides (T4) captan + hexaconazole (70.72%) and (T5) thiophanate methyl + pyraclostrobin (36.67%) treatment showed least inhibition over control. Among the botanicals (T7) *Allium sativum* showed 100% inhibition of *Aspergillus niger* at 10% concentration, whereas rest of botanicals were least effective.

Effectiveness of carbendazim, carbendazim + mancozeb and carboxin + thiram (100%) inhibition of colony growth of *Aspergillus niger* was earlier reported by Andge *et al*. (2017) [1]. Similarly, carbendazim + mancozeb (71.83), carboxin + thiram (65.80) and carbendazim (69.10), reported by Kumari *et al*. (2016) [7] and also carbendazim + mancozeb and carbendazim (100%) inhibited growth of *Aspergillus niger* reported by Prajapati *et al*. (2016) [10].

Effect of fungicides and botanicals on radial mycelial growth of *Fusarium oxysporum*

The result (Table 1) revealed that there was significant difference due to various treatments of fungicides against *Fusarium oxysporum* on 7th DAI over inoculated control, under *in vitro* condition by poison food technique. The radial mycelial growth of tested organism was found 100% in inhibition in (T1) carbendazim, (T2) carbendazim + mancozeb, (T3) carboxin + thiram, and (T5) thiophanate methyl + pyraclostrobin over control. Except in (T4) captan + hexaconazole chemical treatment showed 81.06 % inhibition over control. Among the botanicals (T7) *Allium sativum* showed 100% inhibition of *Fusarium oxysporum* at 10% concentration, whereas rest of botanicals showed least effective.

Effectiveness of carbendazim (100%) in inhibition of colony growth of *Fusarium oxysporum* of soybean was earlier reported by Chaity *et al*. (2012) [3], similarly carbendazim + mancozeb (100%), carboxin + thiram (91.25%), captan + hexaconazole (82.44%) was also reported effective in inhibition of mycelial growth of *Fusarium oxysporum* by Singh *et al*. (2017) [13].

Effect of fungicides and botanicals on radial mycelial growth of *Rhizoctonia bataticola*

The result (Table 1) revealed that there was significant difference due to various treatments of fungicides against *Rhizoctonia bataticola* on 7th DAI over inoculated control, under *in vitro* condition by poison food technique. The radial mycelia growth of tested organism was found 100% in inhibition in (T2) carbendazim + mancozeb, (T3) carboxin + thiram over control, followed by (T1) carbendazim (96.54%), (T4) captan + hexaconazole (88.51%) and (T5) thiophanate methyl + pyraclostrobin showed (87.04%) inhibition over control. Among the botanicals (T7) *Allium sativum* showed (87.04%) inhibition of *Rhizoctonia bataticola* at 10% concentration, whereas rest of botanicals showed least effective.

Effectiveness of carbendazim + mancozeb and carboxin + thiram (100%) inhibition of colony growth of *Rhizoctonia* spp., was earlier reported by Mandhare and Suryaswami,

(2009) [8]. Similarly carbendazim + mancozeb, and thiophanate methyl (100%) inhibition growth of *Rhizoctonia bataticola* reported by Pawar *et al*. (2018) [9], carbendazim + mancozeb, carboxin + thiram and carbendazim (100%) inhibition also reported by Rajput *et al*. (2016) [12].

Effect of fungicides and botanicals on radial mycelial growth of *Sclerotium rolfsii*

The result (Table 1) revealed that there was significant difference due to various treatments of fungicides against *Sclerotium rolfsii* on 7th DAI over inoculated control, under *in vitro* condition by poison food technique. The radial mycelial growth of tested organism was found 100% in inhibition in (T3) carboxin + thiram and (T4) captan + hexaconazole over control, followed by (T2) carbendazim + mancozeb 96.42% and (T5) thiophanate methyl + pyraclostrobin 79.25% over control. The (T1) carbendazim (0.00%) showed completely fail to inhibit mycelial growth of *Sclerotium rolfsii*. Among the botanicals (T7) *Allium sativum* showed 100% inhibition of *Sclerotium rolfsii* at 10% concentration, whereas rest of botanicals showed least effective.

Effectiveness of carboxin + thiram and carbendazim + mancozeb (100%) inhibition of colony growth of *Sclerotium rolfsii* was earlier reported by Das *et al*. (2014) [4]. Similarly carboxin + thiram (100%), carbendazim + mancozeb (100%) was also reported effective in inhibition of mycelial growth of *Sclerotium rolfsii* by Vineela *et al*. (2017) and thiophanate methyl (89.0%) reported by Das *et al*. (2014) [4].

Effect of fungicides and botanicals on radial mycelial growth of *Alternaria alternata*

The result (Table 1) revealed that there was significant difference due to various treatments of fungicides against *Alternaria alternata* on 7th DAI over inoculated control, under *in vitro* condition by poison food technique. The radial mycelial growth of tested organism was found 97.67% in inhibition in (3) carboxin + thiram 97.70%, (T2) carbendazim + mancozeb 96.88%, (T4) captan + hexaconazole, 95.24%, (T5) thiophanate methyl + pyraclostrobin 94.91% and carbendazim 90.49% over control. Among the botanicals (T7) *Allium sativum* showed 77.15% inhibition of Alternaria alternata at 10% concentration, whereas rest of botanicals showed least effective.

Effectiveness of carboxin + thiram, carbendazim + mancozeb, thiophanate methyl and carbendazim (100%) inhibition of colony growth of *Alternaria alternata* was earlier reported by Suryavanshi *et al*. (2018), similarly carbendazim (85.41%) was also reported effective in inhibition of mycealial growth of *Alternaria alternata* by Jakatimath *et al*. (2017) [5], carbendazim and carbendazim + mancozeb (100%) inhibition growth of *Alternaria* spp., it reported by Prasad *et al*. (2018) [11].

Conclusion

Among the different option available for the management, chemicals are neither economically viable, nor safe for the environment still the chemicals due to the immediate effect and higher antifungal activity are used at large scale for controlling pathogens. Among fungicides combination of carbendazim 12% + mancozeb 63% and from botanicals *Allium sativum* (Clove extract) was found most effective in controlling seed borne mycoflora of groundnut.

Table 1: Efficacy of five fungicides and five botanicals against major seed borne fungi of groundnut

Tr. No.	Treatment details	Conc. (%)	Per cent growth inhibition over control	Per cent growth inhibition over control	Per cent growth inhibition over control	Per cent growth inhibition over control	Per cent growth inhibition over control	Per cent growth inhibition over control
			A.fl.	A.n.	F.o.	R.b.	S.r.	A.al.
T_1	Carbendazim 50% WP	0.1	82.94	100.00	100.00	100.00	0.00	55.33
T_2	Carbendazim 12% + Mancozeb 63% WP	0.2	100.00	100.00	100.00	100.00	71.48	84.77
T_3	Carboxin 37.5% + Thiram 37.5 % WS	0.2	87.30	100.00	100.00	100.00	100.00	100.00
T_4	Captan 70% + Hexaconazole 5%	0.2	86.51	70.42	81.06	88.52	100.00	86.55
T_5	Thiophanate methyl 450 g/l + Pyraclostrobin 50 g/l FS	0.2	79.36	36.57	100.00	87.04	55.18	68.53
T_6	*Azadirachta indica* (Leaf extract)	10	51.98	27.62	66.67	77.41	0.00	53.80
T_7	*Allium sativum* (Clove extract)	10	85.32	100.00	100.00	87.04	100.00	77.15
T_8	*Ocimum sanctum* (Leaf extract)	10	22.61	22.95	62.88	75.55	0.00	70.05
T_9	*Curcuma longa* (Rhizome extract)	10	57.94	54.08	78.40	81.11	72.22	75.63
T_{10}	*Zingiber officinale* (Rhizome extract)	10	54.76	22.18	79.17	84.07	0.00	72.08

Where, A.fl: *Aspergillus flavus* A.n: *Aspergillus niger* F.o: *Fusarium oxysporum*
R.b: *Rhizoctonia bataticola* S.r: *Sclerotium rolfsii* A.al: *Alternaria alternata*

References

1. Andge RB, Parate RL, Sawai HR, Kalaskar RP. In vitro studies on management of collar rot caused by Aspergillus Niger in groundnut. Soil Crop. 2017; 27(1):80-83.
2. Bansal RK, Sobti AK. Control of Aspergillus flavus associated with groundnut seeds. Indian Phytopath. 1988; 4(4):643-644.
3. Chaity SA, Khan AA, Mian IH. In vitro evaluation of fungicides and botanicals against Fusarium oxysporum and Macrophamina phaseolina isolated from soybean

seeds. Bangladesh Phytopathol. Soc. 2012; 28(1 and 2):59-62.
4. Das NC, Dutta BK, Ray DC. Potential of some fungicides on the growth and development of Sclerotium rolfsii in vitro. Int. J Sci. Res. 2014; 4(12):2250-3153.
5. Jakatimath SP, Mestha RK, Biradar IB, Mushrif SK, Ajjappalva PS. In vitro evaluation of fungicides botanicals and bio-agent against Alternaria alternata causal agent of fruit rots of brinjal. Int. J Curr. Microbiol. App. Sci. 2017; 6(5):495-504.
6. Kakde RB, Badar KV, Pawar SM, Chavan AM. Storage mycoflora of oilseeds. Int. J Multi. Res. 2012; 2(3):39-42.
7. Kumari M, Singh M, Godika S, Choudhari S, Sharma J. Effect of different fungicides, plant extract, on incidence and varietal screening against collar rot of groundnut (*Arachis hypogea* L.) caused by Aspergillus niger van tighan. J Bio. Sci. 2016; 11(4):2835-2839.
8. Mandhare VK, Suryasanshi AV. In viro evaluation of botanicals against pathogen causing chickpea disease. J Pl. Dis. Sci. 2009; 4(1):128-129.
9. Pawar AD, Ingole MN, Kendre VP. Efficacy of fungicides, bioagent and organic amendment to manage root rot in green gram. Int J Chem. 2018; 6(1):1355-1359.
10. Prajapati BK, Patil RK, Alka. Bio-efficacy of fungicides in management of black mould rot (*Aspergillus niger*) of onion. Int. J Agril. Sci. Res. 2016; 6(4):155-160.
11. Prasad SV, Bhattiprolu SL, Kumari VP, Kumar PV. In vitro evaluation of fungicides against Alternaria macrospora causing leaf spot of cotton. Int J Curr. Microbiol. App. Sci. 2018; 7(1):2551-2557.
12. Rajput LS, Harlapur SI, Venkatesh I, Agrawal SK, Choudhary M. In vitro study of fungicides and antibiotic against Rhizoctonia solani causing banded leaf and sheath blight of maize. Int. J Agril. Sci. 2016; 8(54):2846-2848.
13. Singh KJ, Kumar M, Kumar S, Kumar A, Mehta N. Effect of chemicals and antagonist on growth and sporulation of Fusarium oxysporium causing wilt of chilli. Int. J Chem. 2017; 5(5):2175-2181.
14. Suryawanshi AP, Patil AC, Anbhule KA, Hurule SS, Raner RB. Effect of seed dressing fungicides against major seed borne fungi of sunflower. Int. J Curr. Microbiol. App. Sci. 2018; 6:2521-2526.
15. Vincent JM. Distribution of fungal hyphae in the presence of certain inhibitors, Nature 1947; 150:850
16. Wani AH, Kuruchache VA. In vitro inhibitory effect of fungicides and botanicals on seed borne fungi. Int. J Biopest. 2004; 4(1):53-55.