International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2016): 79.57 | Impact Factor (2015): 6.391

Effect of Fungal Metabolites on Seed Germination and Seedling Growth of *Withania somnifera* (L) Dunal

Adeeba Anwar[1], A. R. Ansari[2]

[1]M. B. Govt. P. G. College, Haldwani, Nainital, Uttarakhand

[2]Govt. Degree College Gairsain, Chamoli, Uttarakhand, India

Abstract: ***Ashwagandha (Withania somnifera [L.] Dunal).is a medicinal plant. During present study, effects of metabolites of common and dominant seed-borne fungi on seed heath of Ashwagandha are evaluated. Culture filtrates of Alternaria alternata, A. flavus, A. fumigates, Aspergillus niger, Fusarium oxysporum, Penicillium citrinum and. Rhizopus sp. were used. These common and dominant seed-borne fungi produced mycotoxins that affected adversely to the seed germination, shoot and root length of Ashwagandha in variable quantity.***

Keywords: *Withania somnifera*, Ashwagandha, , fungal metabolites, seed germination

1. Introduction

Ashwagandha (*Withania somnifera* [L]. Dunal.) is important medicinal plant belonging to the family Solanaceae. It is a native of Mediterranean region and commonly occurs in arid and semi arid part of India. It is a small shrub up to 30 -132 cm. height. It is commonly grown in Srilanka, Egypt, Israel, Jorden, Sudan, Iran, Afganisthan, Pakisthan (Agarwal et al., 2004). It is most important due to presence of alkaloids, Withanoloids, steroids, lactones which have antimicrobial properties so that the plant are used for prepare the medicines (Baraiya, et al., 2005). Ashwagandha roots, leaves, tubers and seeds are used as in medicines, against ulcers, hiccup, asthama, bronchitis, female disorder and dropsy. The roots of this important medicinal plants were also prescribed for curing general sexual weakness in human. It is general tonic to improve overall health, energy and longevity. The important preparations of ashwagandha is Aswagandharishtam, Chavanprasam and Narayana Tailum (Patel et al., 2003). This crop is cultivated in north western region in about 4000 ha. (Kattimani et al., 2000).

Fungal metabolites are those substances which are produced by fungi during their metabolic processes. The constituents of metabolites are phenols, terpenoids, amino acids and plant growth regulators (Griffin, D.H., 1981). Aspergellic acid, aflatoxin B1 and B2, cyclopiczonic acid,fusaric acid, naphthoquinones and fumonizin are some of those substances which threaten the health of plants and animals, (Singh *et al.* 1991). Seed-borne fungi are responsible for inhibiting normal growth of seedlings in various crops, (Howlett, 2006). (Kritzinger *et al*.2003) observed that the mycotoxin produced by *Fusarium proliferatum* reduces seed germination.

2. Material and Method

The common and dominant seed-borne fungi of *Withania somnifera*, were culture in Czapek's media (KH_2PO_4 1.0gm, $MgSO_4$ 0.5gm, KCI1.0 gm, $FeSO_4$ traces, yeast powder 0.5 gm, $NaNO_3$ 2.0gm, Dextrose 10.0gm, agar agar 15.0gm in one liter solution) for seven days at 25±1°C. Fungal mycelium from pure culture was aseptically transferred to liquid Czapek's media cultured for 10 days at 25±1°C. Filtered with Whatman filter paper no. 1 and centrifused at 10,000 rpm for 10 minutes. The filtrates were used to soak the seeds. The treated seeds were then put to germination test. Percent germination and seedling growth were recorded.

3. Result

Table shows that a total of seven common and dominant fungi of *Withania somnifera* were selected for study which produced toxic metabolites. These mycotoxins affected seed germination, and seedling length . Germination percentage and seedling growth in fungal metabolites were recorded as follows. In *Alternaria alternate* germination percent and seedling length were found 54.2% and 2.8 cm, in *Aspergillus flavus* germination percent and seedling length were found 27.5% and 1.9 cm, in *A .fumigates* germination percent and seedling length were found 46.3% and 2.7 cm, in *Aspergillus niger* germination percent and seedling length were found 32.2% and 2.0 cm, in *Fusarium oxysporum* germination percent and seedling length were found 23.5% and 1.8 cm, in *Penicillium citrinum* germination percent and seedling length were found 40.0% and 2.6 cm, in *Rhizopus stolonifer* germination and seedling length were

Table: Effect of fungal metabolites on seed germination and seedling growth

Sr. no.	Mycoflora	% of seed germination	Root length (cm)	Shoot length (cm)	Seedling length (cm)
1	*Alternaria alternate*	54.2	1.6	1.2	2.8
2	*Aspergillus flavus*	27.5	1.1	0.8	1.9
3	*Aspergillus fumigatus*	46.3	1.5	1.2	2.7
4	*Aspergillus niger*	32.2	1. 2	0.8	2.0
5	*Fusarium oxysporum*	23.5	1.2	0.6	1.8
6	*Penicillium citrinum*	40.0	1.6	1.0	2.6
7	*Rhizopus* sp.	52.5	1.4	1.3	2.7
8	Control	84.0	2.2	1.7	3.9

found 52.5% and 2.7 cm, and in control condition germination percent and seedling length were found 84.0% and 3.9 cm respectively

4. Discussion

Results presented in Table show that, mycotoxins obtained from all common and dominant seed-borne fungi affected adversely seed germination, shoot and root length of *Withania somnifera* . There is great reduction in percent seed germination due to *Fusarium oxysporum*, *Aspergillus flavus* and followed by *Aspergillus niger*, *P. citrinum* and *A. fumigatus*. Minimum reduction in percent seed germination was noticed due to *Alternaria alternate* and *Rhizopus* sp. . As regards to root lengths *Aspergillus flavus*, *Aspergillus niger* reduced root length to maximum. There was least reduction in root length due to mycotoxin of *Penicillium citrinum*. As regarded to shoot length *Fusarium oxysporum* reduced shoot length to maximum and there was least reduction in shoot length due to mycotoxin of *Rhizopus* sp. Shoot and root lengths were reduced to maximum due to and *Fusarium oxysporum* and *Aspergillus niger* and there was least reduction in shoot and root length due to *Alternaria alternata*.

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Author Profile

Adeeba Anwar received the B.Sc. and M.Sc. degree from Kumaun University Nainital Utttarakhand in 2007 and 2011, now she is a research scholar and at the post of UGC MRP project fellow in MBPG College Haldwani, K U Nainital Uttrakhand.

Proff. A.R. Ansari received the **B.Sc**.,M.Sc., M Phil, and Ph.D. degree in 1974, 1976, 1977 and 1982 from Aligarh Muslim University U.P., India. During 1981 he was posted as degree college lecturer in uttarkashi Uttarakhand. During 2006 – 2017 he stayed in MBPG College Haldwani, Nainital Uttarakhand at the post of Associate professor. He is now Principle of Gov. Degree college Gairsain ,Chamoli Uttarakhand.