

Phytoextracts: An Eco-friendly Approach for Management of Groundnut Seed Borne Fungi Under Storage

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Seed infecting fungi are important constraints for the groundnut crop prior harvesting to storage. Many improved varieties have been developed in several countries in recent years, many of them were found susceptible to diseases due to narrow genetic makeup. Many fungal pathogens attack on the seeds and hamper seed health. Phytoextracts is only one superior option for farmer's point of view on the basis of prevention is better than cure. All the tested phytoextracts were superior to reduce seed mycoflora load of groundnut over control under storage condition. Minimum per cent occurrence of fungi was observed in the treatment Neem leaf extract (10%) in the range of 4.00 to 11.50, 5.00 to 11.50, 5.50 to 13.00 and 6.50 to 13.50 per cent after one, two, three and four months storage respectively followed by tulsi leaf extract (10%).

Key words: Groundnut, Fungi, Seed health and Storage.

Groundnut (*Arachis hypogea* L.) is commercially important oilseed crop grown in about 100 countries covering 26.4 million hectares with a total production of 36.1 million tones of nuts in shell. In India, Karnataka, Andhra Pradesh, Gujarat and Maharashtra are the leading states in production of groundnut. In Gujarat, total area under cultivation of groundnut is about 18, 83,900 hectares with the production of 26, 64, 300 M.T of seeds with average productivity of 1414 kg ha⁻¹. In Dang, groundnut occupies about 4700 ha area with a total production of 6600 M.T with average productivity of 1411 kg ha⁻¹ (Anon., 2013). Many of these agents are major constraints of groundnut production and reduce yields as well as quality of crop substantially. Its seeds and seedlings are highly susceptible to several pathogens. Deterioration of groundnut seeds due to fungal activity is normally associated with the production

of off-colours and flavours, rancidity, discolouration, effects on yield and quality of oil, loss of seed viability and formation of mycotoxins (Twiddy, 1994). Fungi like *Aspergillus niger* var. Tieghem, *A. flavus* Link ex Fries., *Alternaria dianthicola* var. Neerg, *Curvularia lunata* (Wakker)Boedijn, *C. pellescens* Boedijn, *Fusarium oxysporum* f. sp. Ciceris (Padwick), *F. equiseti* f. sp. Cubense, *Macrophomina phaseolina* (Tassi) Goid, *Rhizopus stolonifer* (Ehrnb.Fr.)Vuill, *Penicillium digitatum* (Pers.) Sacc. and *P. chrysogenum* Thom. causes discolouration, rotting, shrinking, seed necrosis, loss in germination capacity and toxification to groundnut (Chavan and Kakde, 2008). Microbial seed deterioration is one of the most serious biotic constraints to the quality production of groundnut seeds. Several plant fauna were found in nature having antifungal activity and also available in nature readily and cheaply which is very useful option to farmers so as to avoid the use of chemical fungicides. Seed treatment with effective

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fungicides and bio agent can manage the seed borne pathogens and increase the seed germination and yield. Attempt was made to find out superior phytoextract that is essential for establishing desired plant population, good plant growth and better yield.

MATERIAL AND METHODS

Different phytoextracts were evaluated to test the efficacy of indigenous plant products against seed borne fungi of groundnut. For this 200 gm seeds of local varieties were taken from farmers own stored seed samples. Seeds were mixed thoroughly with plant extract and sealed separately in cloth bags and stored under ambient condition up to four months. Untreated seeds sealed in another cloth bags served as control. Seed mycoflora were examined after two months of storage by standard blotter technique (Bhale *et al*, 2001). In sterilized Petri plates (15cm) lined with three blotting papers, 10 seeds were placed aseptically with uniform spacing with three repetitions and incubated at $26 \pm 1^\circ\text{C}$. Observations of seed mycoflora were made after 1, 2, 3 and 4 months after incubation. The fungal population was expressed in terms of per cent occurrence for each fungal species with the following formula.

$$\text{Per cent occurrence} = \frac{\text{No. of seeds on which growth of fungal species detected}}{\text{Total No. of seeds examined}} \times 100$$

Fresh and healthy clove of Garlic and leaves of Neem, Tulsi, Nilgiri, Dhatura, Turmeric and Ginger plant were washed thoroughly with tap water, cut into small pieces and then macerated separately in sterilized distilled water (1:1 w/v basis) by blender. Thus, prepared extracts of each were filtered through double layer sterilized muslin cloth

to remove extraneous material, and were considered as 100 per cent extract. Standard extracts were further diluted to the required concentration using sterilized distilled water.

RESULTS AND DISCUSSION

The result on efficacy of different phytoextracts against seed mycoflora of groundnut under storage condition presented in Table 2 and 3 revealed that overall, the phytoextracts were superior to reduce seed mycoflora load of groundnut over control. The phytoextracts such as Garlic clove extracts, Neem leaf extracts, Tulsi leaf extracts, Nilgiri leaf extracts, Dhatura leaf extracts, Turmeric leaf extracts and Ginger rhizome extracts recorded occurrence of fungi, *S. rolfsii* (4.00 to 14.00 %) and (5 to 14 %), *Helminthosporium* sp. (4.50 to 13.00 %) and (5.00 to 13.50 %), *F. equiseti* (5.00 to 15.00 %) and (5.50 to 15.50 %), *F. moniliforme* (6.00 to 14.50 %) and (7.00 and 15.00 %), *A. niger* (10.50 to 17.50 %) and (13.00 to 18.00 %) and *A. flavus* (11.50 to 19.00 %) and (11.50 to 19.50 %) after one and two months of storage, respectively. Minimum per cent occurrence of fungi was observed in the treatment Neem leaf extract in the range of (4.00 to 11.50 %) and (5.00 to 13.00 %) followed by Tulsi leaf extracts (4.50 to 14.50 %) and (5.50 to 15.00 %), Garlic clove extract (5.00 to 15.00 %) and (5.50 to 16.00 %) and Turmeric leaf extract (6.00 to 13.50) and (6.00 to 13.50 %) after one and two months of storage, respectively. Similarly, occurrence of fungi after three and four months of storage recorded, *S. rolfsii* (5.50 to 15.00) and (6.50 to 17.50%), *Helminthosporium* sp. (5.50 to 15.00) and (6.50 to 18.00), *F. equiseti* (6.50 to 16.00 %) and (7.00 to 18.50 %), *F. moniliforme* (8.00 to 16.00 %) and (9.00 and 17.50 %), *A. niger* (13.00

Table 1. List of phytoextracts used for seed treatment

| S. No. | Common Name | Scientific Name | Concentration ml/ kg seed |
|--------|-------------|----------------------------------|---------------------------|
| 1 | Garlic | <i>Allium sativum</i> L. | 1ml |
| 2 | Neem | <i>Azadirchta indica</i> A Juss | 1gm |
| 3 | Tulshi | <i>Ocimum sanuatum</i> L. | 1ml |
| 4 | Nilgiri | <i>Eucalyptus citridora</i> Hook | 1ml |
| 5 | Dhatura | <i>Dhatura stramonium</i> L. | 1ml |
| 6 | Turmeric | <i>Curcuma longa</i> L. | 1ml |
| 7 | Ginger | <i>Zingiber officinalis</i> Rosa | 1ml |
| 8 | Control | | - |

Table 2. Efficacy of phytoextracts against seed mycoflora of groundnut after one and two month under storage condition

| S. No. | Treatments / phytoextracts | Per cent occurrence of seed mycoflora * | | | | | | | | | | | |
|--------|----------------------------|---|-------|-------|-------|-------|-------|----------------------------|-------|-------|-------|-------|-------|
| | | After one month of storage | | | | | | After two month of storage | | | | | |
| | | A | B | C | D | E | F | A | B | C | D | E | F |
| 1 | Garlic clove extracts | 5.00 | 6.00 | 7.50 | 9.00 | 14.00 | 15.00 | 5.50 | 7.00 | 7.00 | 10.00 | 14.50 | 16.00 |
| 2 | Neem leaf extracts | 4.00 | 4.50 | 5.00 | 6.00 | 10.50 | 11.50 | 5.00 | 5.00 | 5.50 | 8.00 | 13.00 | 11.50 |
| 3 | Tulsi leaf extracts | 4.50 | 8.50 | 8.50 | 7.50 | 13.50 | 14.50 | 5.50 | 9.00 | 9.50 | 8.50 | 15.00 | 13.50 |
| 4 | Nilgiri leaf extracts | 6.50 | 5.50 | 7.50 | 8.00 | 13.50 | 13.50 | 7.00 | 6.00 | 9.00 | 9.00 | 14.00 | 13.00 |
| 5 | Dhatura leaf extracts | 5.50 | 5.00 | 5.50 | 6.50 | 14.00 | 14.50 | 5.50 | 5.50 | 6.00 | 7.00 | 14.00 | 13.50 |
| 6 | Turmeric leaf extracts | 6.00 | 5.50 | 5.00 | 6.00 | 13.00 | 13.50 | 6.50 | 6.00 | 6.00 | 8.00 | 13.50 | 13.50 |
| 7 | Ginger rhizome extracts | 8.00 | 7.00 | 6.00 | 7.00 | 13.50 | 14.00 | 8.00 | 8.00 | 7.00 | 8.00 | 14.00 | 15.00 |
| 8 | Control | 14.00 | 13.00 | 15.00 | 14.50 | 17.50 | 19.00 | 14.00 | 13.50 | 15.50 | 15.00 | 18.00 | 19.50 |

*Average of three repetition and 200 seeds in each treatment

A) *Sclerotium rolfsii* B) *Helminthosporium* sp. C) *Fusarium equiseti* D) *Fusarium moniliforme* E) *Aspergillus niger* F) *Aspergillus flavus***Table 3.** Efficacy of phytoextracts against seed mycoflora of groundnut after one and two month under storage condition

| S. No. | Treatments / phytoextracts | Per cent occurrence of seed mycoflora * | | | | | | | | | | | |
|--------|----------------------------|---|-------|-------|-------|-------|-------|-----------------------------|-------|-------|-------|-------|-------|
| | | After three month of storage | | | | | | After four month of storage | | | | | |
| | | A | B | C | D | E | F | A | B | C | D | E | F |
| 1 | Garlic clove extract | 6.00 | 7.50 | 8.00 | 10.50 | 14.50 | 17.00 | 6.50 | 8.00 | 9.00 | 11.00 | 15.00 | 17.50 |
| 2 | Neem leaf extracts | 5.50 | 5.50 | 6.50 | 8.50 | 13.00 | 12.00 | 6.50 | 6.50 | 7.50 | 9.00 | 13.50 | 13.00 |
| 3 | Tulshi leaf extracts | 6.00 | 10.00 | 10.00 | 9.50 | 15.50 | 14.00 | 7.50 | 10.50 | 11.00 | 10.00 | 16.00 | 15.00 |
| 4 | Nilgiri leaf extracts | 8.00 | 7.50 | 9.50 | 10.00 | 14.00 | 12.50 | 9.00 | 8.00 | 10.50 | 10.50 | 14.00 | 14.50 |
| 5 | Dhatura leaf extracts | 6.00 | 6.00 | 6.50 | 8.00 | 14.50 | 14.00 | 7.50 | 7.50 | 7.00 | 9.50 | 14.50 | 15.00 |
| 6 | Turmeric leaf extracts | 7.00 | 7.00 | 7.50 | 9.00 | 14.00 | 14.00 | 8.50 | 8.50 | 8.00 | 10.00 | 14.50 | 15.50 |
| 7 | Ginger rhizome extracts | 9.00 | 8.50 | 7.50 | 8.50 | 14.50 | 15.00 | 10.00 | 9.00 | 9.00 | 9.50 | 14.50 | 16.50 |
| 8 | Control | 15.00 | 15.00 | 16.00 | 16.00 | 19.50 | 21.00 | 17.50 | 18.00 | 18.50 | 17.50 | 21.50 | 22.50 |

*Average of three repetition and 200 seeds in each treatment

A) *Sclerotium rolfsii* B) *Helminthosporium* sp. C) *Fusarium equiseti* D) *Fusarium moniliforme* E) *Aspergillus niger* F) *Aspergillus flavus*

to 19.50 %) and (13.50 to 21.50 %) and *A. flavus* (12.00 to 21.00 %) and (13.00 to 22.50 %) after three and four months of storage, respectively. Minimum per cent occurrence of fungi was observed in the treatment of Neem leaf extract in the range of (5.50 to 13.00 %) and (6.50 to 13.50 %) followed by Tulsi leaf extracts (6.00 to 15.50 %) and (7.50 to 16.00%), Garlic clove extract (6.00 to 17.00 %) and (6.50 to 17.50 %) and Turmeric leaf extract (7.00 to 14.00 %) and (8.00 to 15.50 %) after three and four months of storage, respectively. Highest mycoflora load was observed in control treatment in all the four storage periods. Thus, it was interesting to note that fungal infection increased with increased period of storage. These finding confirms the observations of Savitri *et al.* (1998). They reported that per cent occurrence of fungi on groundnut seeds was maximum after five and six months as compared to one, two and three months of storage. Lbiam and Egwu (2011) and Taghi *et al.* (2010) also reported that frequency of seed borne fungi such as *Aspergillus flavus*, *A. niger*, *A. terreus*, *A. culmorum*, *A. fumigates*, *A. tamari*, *Fusarium moniliforme*, *Mucor rouxii*, *Penicillium spp.*, *Cladosporium spp.* and *Aureobasidium pullulans* of groundnut was increased with increased storage period. These observations tally with the findings of present investigation. Once fungal infection of seeds takes place in storage, it is likely that infection gets aggravated with passage of time due to congenial condition in storage resulting into more seed deterioration when storage period is extended. Thus, seed treatment with Neem leaf extracts five per cent during storage protected seed from seed borne fungi and thereby improved seed health status in respect to fungal infection and their subsequent effect on seed quality. Effectiveness of Neem against different seed borne fungi of groundnut has also been reported by

Kadam *et al.* (2008) who reported that seeds were treated with aqueous leaf extract of Neem (5%) for 5 minutes recorded significantly lowest seed borne fungi of groundnut which is in conformity with present investigation.

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