The Bioscan 8(2): 685-687, 2013 (Supplement on Medicinal plants)
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
www.thebioscan.in

THE ANTI-FUNGAL PROPERTIES OF AQUEOUS EXTRACTS FROM *PSOROLEA CORYLIFOLIA* LINN. SEEDS IN CONTROLLING GRAIN SMUT AND SEED QUALITY ENHANCEMENT OF SORGHUM

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KEYWORDS
Psorolea corylifolia
Babchi oil
Aqueous extracts
Anti-fungal
Grain smut

Received on :
14.02.2013

Accepted on :
05.05.2013

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ABSTRACT
There are numerous cultivated medicinal plants like *Babchi* (*Psorolea corylifolia* Linn. used in folkore medicines for treatment of many human diseases. In an experiment at UAS, Raichur, the aqueous extract of seeds of this plant was treated with sorghum seeds infected with grain smut to know the effect on disease control and seed quality enhancement. The *babchi* oil treated along with a clear and inert polymer at 5-6 mL/kg seeds almost reduced the infection level and disease severity index to 50%. The seeds treated with 8 mL/kg seeds produced lowest infection level (20.40%) and disease severity index (10.2). Also this seed treatment recorded highest seed quality enhancement like germination (84%), seedling vigour index (1688), seedling dry weight (0.32g), relative dry weight (1.9g) and 100 seed weight (5.2g).

INTRODUCTION

In India and other parts of the world the use of medicinal plants in folkore medicines is widely practiced. Currently studies pertaining to the use of botanicals in management of pathogens and related diseases are highly focused (Koche, 2013; Toppo, 2013; Mathad, 2013; Mathad, 2013; Mahapatra, 2013; Bisht, 2013). Among the numerous cultivated medicinal plants *Babchi* (*Psorolea corylifolia* Linn. Family- *Fabaceae,*sub family- *Papilionaceae*), a leguminous plant is under cultivation as medinal plant. Since generations this crop grows as winter season weed in pastures and forest areas. The entire plant is used both internally and externally for treatment of numerous skin ailments. The economic part of this plant is seed and it has aromatic, anthelmintic, antipyretic, laxative, alexiteric, antibacterial and antifungal properties (Kirtikar and Basu, 1994). It known to cure leprosy ('*Kushtanashini*'), leucoderma and psoriasis (Mukherjee, 2002; Rajpal, 2005). The commercial cultivation is not widely followed, but collection of seed from the wild is very popular among the land less labourers and fetches 600-700 rupees / kg. Seed, being economic part known to have anti-fungal properties. The essential oils and aqueous solutions extracted from seed are commercially available and used for medicinal properties. Steam distillation is the most commonly used method for commercial production. The aqueous extracts contain many tannins, flavonoids and terpenoids which known to have anti-fungal properties which can be used for plant disease control (Sharmishtha and Praveen, 2012). The grain smut of sorghum known reduce yield considerably and perpetuate to next crop through seed. An ex periment was conducted in UAS; Raichur in 2012-13 with objective of studying anti-fungal properties of water based extracts in controlling grain smut, an important seed borne disease of sorghum caused by *Sporisorium sorghi*. The aqueous extracts of *babchi* oil were used in seed treatment along with inert polymers to know the effect on grain smut and seed quality parameters were the objectives of the study.

MATERIALS AND METHODS

Collection of the babchi (*Psorolea corylifolia* Linn.) seeds

The seeds were collected from Bijapur area of Karnataka state from the pastures and forest areas. The seeds were cleaned using a gravity separator and working samples were prepared for various tests as per ISTA guidelines (2013).

Collection of the sorghum seeds

The seeds of sorghum were collected from *rabi* crop grown and disease infected ear heads were collected and kept in a refrigerator. The seeds were separated and but not graded.

Extraction of oil

The oil was extracted by steam distillation. The oil was further

Table 1: The effect of aqueous extracts of *Babchi* (*Psorolea corylifolia* Linn) on disease incidence and seed quality in sorghum

Treatments	IL %	DSI@ 80DAS	GE %	RoG	RL(cm)	SL(cm)	SVI	SDW(g)	RDW%	100 SW(g)
T-1-Control	82.17	82.1	67	9.03	9.50	6.0	1039	0.017	1.0	3.9
T-2-1 mL	77.40	77.4	68	9.59	8.90	6.2	1027	0.016	0.9	4.0
T-3-2 mL	78.17	58.7	66	8.81	9.00	6.1	997	0.016	0.9	4.0
T-4-3 mL	64.27	48.2	74	11.17	9.00	6.2	1125	0.016	0.9	3.8
T-5-4 mL	57.43	43.1	69	11.09	9.50	6.2	1083	0.018	1.1	4.0
T-6-5 mL	47.43	35.6	78	11.75	9.50	6.9	1279	0.02	1.2	3.9
T-7-6 mL	33.67	22.0	75	12.16	11.2	7.2	1380	0.019	1.1	4.5
T-8-7 mL	21.93	11.0	80	13.07	10.9	8.1	1520	0.021	1.2	5.0
T-9-8 mL	20.40	10.2	84	14.68	11.6	8.5	1688	0.032	1.9	5.2
T-10-9 mL	21.73	10.9	74	11.88	10.2	7.4	1302	0.017	1.0	4.8
T-11-10 mL	22.30	11.2	73	11.55	10.5	7.0	1278	0.017	1.0	4.9
S.Em +/-	0.88	0.66	1.03	0.04	0.13	0.06	6.30	0.03	0.07	0.05
CD (5 %)	2.52	1.88	3.00	0.12	0.37	0.17	18.40	0.09	0.20	0.14
T	S	S	S	S	S	S	S	NS	S	S
R	NS	NS	NS	S	NS	S	NS	S	S	S

IL- Infection Level (%); SL - Shoot Length (cm); DSI- Disease Severity Index; SVI- Seedling Vigour Index; GE- Germination (%); SDW- Seedling Dry Weight (g); RoG- Rate of Germination; RDW- Relative Dry Weight (g); RL- Root Length (cm); 100 SW - 100 Seed weight (g)

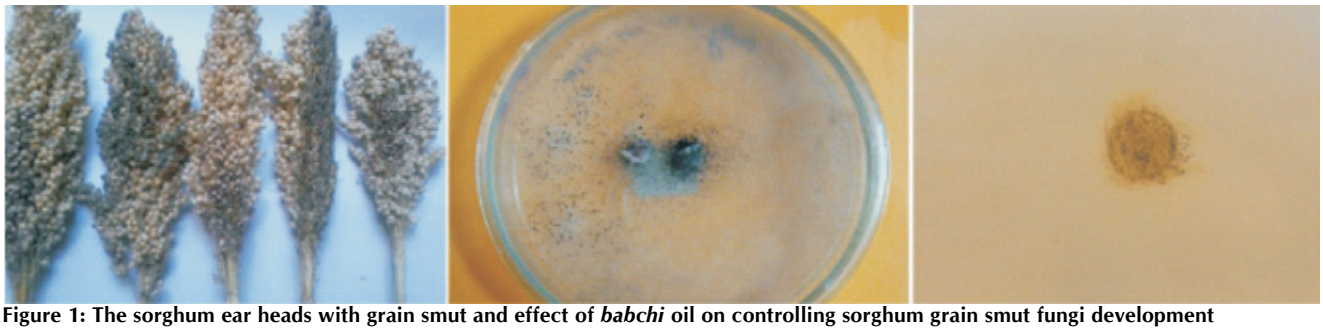

Figure 1: The sorghum ear heads with grain smut and effect of *babchi* oil on controlling sorghum grain smut fungi development

distilled by rotary evaporator. Approximately 1.0 kg of *babchi* seed yield around 250mL of oil. Essential oil was dissolved in methanol (0.3mL oil/ 2mL methanol). The oil was transferred into sterile vials and stored at –20ºC in a deep freezer till its usage.

Seed treatment with *babchi* oil

The sorghum seeds were treated with *babchi* oil in broth form in various concentrations from 1 to 10/kg of seed. To ensure binding of *babchi* oil to seed, a special inert colourless-transperant polymer @4mL/kg (INCOTEC) was used for all treatments evenly. The oil was mixed with polymer thoroughly before seed treatment. A pre-trial study was also done to ensure compatibility of polymer and *babchi* oil.

Treatment details

The experiment comprises of 11 treatments involving: T-1: Control (no seed treatment), T-2: 1 mL / kg, T-3: 2 mL / kg, T-4: 3 mL / kg, T-5: 4mL/ kg, T-6: 5 mL / kg, T-7: 6 mL / kg, T-8: 7 mL / kg, T-9: 8 mL/kg, T-10: 9 mL / kg, T-11: 10 mL / kg.

Seed infection evaluation

To evaluate infection whole seed test was conducted. Here ten infected seeds were cultured in potato culture agar and incubated at 25ºC for a week. After incubation, the Petri plates were examined for fungal growth under stereo-binocular mi-croscope (Khare, 1996). The infected seed parts were evaluated to find out infection level % by using the following formula:

Infection level (%) = Total number of infected seed parts / Total number of seed parts × 100

Pathological tests

The seed pathological parameters like disease severity index (DSI) was calculated after sowing of seeds treated with *babchi* aqueous extract for 100 seeds in three replications at 80 days after sowing using the following formula:

Disease Severity Index (DSI) = (Mean Severity based on 0-4 scale X Incidence %)

Seed tests

The seed tests like germination, Germination index or rate of germination (%), shoot length (cm), root length (cm), seedling vigour index, seedling dry weight (g), relative dry weight and 100 seed weight (g) were conducted as per ISTA guidelines (ISTA, 1985).

Data collection and analysis

he data was collected on various seed quality tests and analysed by completely randomised design as per Fisher's method of analysis of variance and interpretation given by Gomez and Gomez (1976).

RESULTS

The effect of *babchi* oil in controlling the fungal growth is indicated in Fig. 1 which depicts its clear antagonistic and anti-fungal property. The results presented in Table 1 show that the seed treatment of sorghum with more than 5 or 6mL/ kg seed recorded higher disease controlling and seed quality parameters. The sorghum seed treated with 8mL/kg of seed recorded lowest infection level (20.40%) and disease severity index (10.2) at 80 days after sowing. The seed parameters like

germination (84%), rate of germination (14.68), root length (11.6cm), shoot length (8.5cm), seedling vigour index (1688), Seedling dry weight (0.32 g), relative dry weight (1.9 g) and 100 seed weight (5.2g) have recorded at highest levels when treated with 8 mL/kg compared to control with no seed treatment at all. However there are variations with respect to lowest seed quality parameters but higher infection and disease severity index were recorded in seeds treated with 1-3mL / kg of *babchi* oil.

DISCUSSION

The low infection level and disease severity index in seed treatment of sorghum with *babchi* oil indicate the presence of certain anti-fungal compounds which control deterioration. These compounds might have restricted the growth of *Sporisorium sorghi*. This observation is in line with earlier results on *Fusarium* sps extracted from paddy, maize and sorghum (Satish *et al.,* 2009). The anti-fungal compounds such as 4-methoxy flavones is known to control fungal growth (Fig. 2) causing of certain plant diseases (Newton *et al.,* 2002). The phenyl derivative Pyranocoumarin of *babchi* known to inhibit Acetylation Activity of Trichothecene 3-O-Acetyltransferase (Tri101) enzyme in *Fusarium* sp. (Srinivasan and Sarada**,** 2012). The similar action might have resulted in controlling of sorghum grain smut when treated with *babchi* oil. Similar observations were made on *Aspergillus* sp. (Satish *et al.,* 2007).

The *babchi* oil treated sorghum along with low infection level also recorded better seed quality parameters germination, seedling vigour, improved dry matter and 100 seed weight. These observations are in agreement with earlier results on maize where aqueous extracts produced better germination and seedling vigour (Kiran *et al.,* 2011). The seed quality enhancement in sorghum may due to presence of certain bio-active compounds like tetracycline, v-codinene and certain tannins. These studies are similar to earlier study on effect of essential oils on rice seeds (Hewett and Griffiths, 1986).

The effectiveness of *babchi* oil in controlling grain smut may help in management and protection from plant diseases. Exploitation of naturally available chemicals from plants would be an ecologically sound method and a prominent commercial fungicide can be obtained in future, replacing toxic fungicides (Varma and Dubey, 1999).

REFERENCES

Bisht, S. Kumar, P., Srinivasanraghvan, A. and Purohit, J. 2013. *In vitro* management of curvularia leaf spot of maize using botanicals, essential oils and bio-control agents. *The Bioscan.* **8 (2): Supplement on Medicinal Plants.** 731-733.

Gomez, J. A and Gomez, A. A. 1976. Statistical Procedure for Agricultural Research (2nd Ed.). *A. Wiley Inc. Sciences Publication, New York, USA.*

Hewett, P. D. and Griffiths, D. C.1986. Biology of Seed Treatment. In: Seed treatment-Jeffs (Ed) British Crop Protection Council Publications, *Thornton Heath.* pp. 7-12.

International Seed Testing Association 1985. International rules for seed testing 1985. *Seed Science and Technology*. **13**: 300-520.

Khare, M. N. 1996. Methods to test seeds for associated fungi. *Indian Phytopathology*. **49**: 319-328.

Kiran, B., Lalitha, V. and Raveesha, K. A. 2011. *In vitro* evaluation of aqueous seed extract of *Psoralea corylifolia* L. on seed germination and seedling vigour of maize. *J. Applied Pharmaceutical Science*. **1**(8): 128-130.

Kirtikar, K. R and Basu, B. D. 1994. Indian Medicinal Plants. 2nd Ed. Mahendra publication. p. 718.

Koche, M. D., Gade, R. M. and Deshmukh, A. G. 2013. Antifugal activity of secondary metabolites produced by *Pseudomonas fluorescens*. *The Bioscan.* **8 (2): Supplement on Medicinal Plants.** 723-726.

Mahapatra, S. and Das, S. 2013. Bioefficacy of botanicals against alternaria leaf blight of mustard under field condition. *The Bioscan.* **8 (2): Supplement on Medicinal Plants.** 675-679.

Mukherjee, P. K. 2002. Quality Control of Herbal Drugs. 1st ed, Business Horizon Pharmaceutical Publishers. p. 600.

Rajpal, V. 2005. Standardization of Botanicals, 2nd ed. Eastern Publisher. pp. 284, 2005.

Sandra, M., Newton, C., Lau, Sudagar S. Gurcha, Gurdyal S. Besra and Colin W. Wright 2002. The evaluation of forty-three plant species for in vitro antimycobacterial activities; isolation of active constituents from Psoralea corylifolia and Sanguinaria Canadensis. *J. Ethnopharmacology.* **79(1):** 57-67

Sangeetha, S. and Sarada, D. V. L. 2012. Antifungal Activity of Phenyl Derivative of Pyranocoumarin from *Psoralea corylifolia L.* Seeds by Inhibition of Acetylation Activity of Trichothecene 3-O-Acetyltransferase (Tri101). *J. Biomedicine and Biotechnology*. (published online)

Satish, S., Mohana, D. C., Raghavendra, M. P and Raveesha, K. A. 2007. Antifungal activity of some plant extracts against important seed borne pathogens of *Aspergillus* sp., *J. Agricultural Technology***. 3(1):** 109–119.

Satish, S., Raghavendra, M. P. and Raveesha, K. A. 2009. Anti-fungal potentiality of some plant extracts against of some plant extracts against *Fusarium* sp. *Archives of Phyto Pathology and Plant Protection*. **42**: 618-625.

Sharmishtha, P. and Praveen, D. 2012. Phytochemical Screening and Antibacterial Potentiality of Essential Oil from *Psoralea corylifolia* Linn. International *J. Bioscience,Biochemistry and Bioinformatics*. **2**:188-191

Toppo, K. I., Gupta, S., Karkun, D., Agrawal, S. and Kumar, A. 2013. Antimicrobial activity of *Sphagneticola trilobata* (L.) Pruski, against some human pathogenic bacteria and fungi. *The Bioscan.* **8 (2): Supplement on Medicinal Plants.** 695-700.

Varma, J. and Dubey, N. K. 1999. Prospectives of botanical and microbial products as pesticides of tomorrow. *Current Science*. **76(2):**172–179.