ISSN: 2277-8713
IJPRBS
A Path for horizing your innovative work
INTERNATIONAL JOURNAL OF PHARMACEUTICAL RESEARCH AND BIO-SCIENCE

STUDIES ON ASSOCIATED MYCOFLORA AND BIODETERIORATION OF CHEMICAL CONSTITUENTS IN DRUG *S. XANTHOCARPUM* LINN. ROOTS UNDER STORAGE

M RASHIDI, SS DEOKULE

Department of Botany, University of Pune, Pune, India.

IJPRBS-QR CODE

PAPER-QR CODE

Accepted Date:
04/12/2012
Publish Date:
27/02/2013

Keywords
Deterioration,
Fungi,
Chemical constituents,
Percentage incidence

Corresponding Author
Mr. M Rashidi
Department of Botany, University of Pune, Pune, India.

Abstract

In the present study, total 18 fungi were associated with fresh samples of *Solanum xanthocarpum* Linn**.** Out of these isolated fungi *F. solani* showed the highest percentage incidence. The drug stored under the influence of different relative humidities *viz*. 30, 50, 75, 96 and 100% showed variation in percentage occurrence as well as biodeterioration of the chemical constituents such as proteins, phenols, alkaloids and glycosides. The drug stored under 96 and100% RH showed maximum deterioration of selected chemical constituents.

INTRODUCTION

This plant formed one of the important plants in Hindu medicine. It is a prickly perennial herb, stem branched much and clothed with dense, stellate and tormentor's hairs. The plant *Solanum xanthocarpum* is commonly called as, "Kateli" or "Katai". The whole plant is useful in vitiated condition of vata and kapha helmintlhiasis, dental caries, flatulence, constipation, flatulence dyspepsia, anorexia, leprosy, skin diseases, hypertension, fever, cough asthma, bronchitis, hiccough, lumbago, haemorrhoids and epilepsy. Uses of the roots are used in humeral asthma, cough, catarrhal, fever and pain in the chest, also dysuria, stone in the bladder costiveness, in dropsy the sequels of the advance stage of fever, leprosy, consumptive complaints, general anasarca, low vitality of the general system enlargement of the liver and spleen[8, 13]. Salar and Suchitra[17] reported aqueous and organic solvent of different part of *S. xanthocarpum* could be as a potential source of natural antimicrobials (*Aspergillus niger*, *Pseudomonas aeruginosa* and *Escherchia coli*). There is not any report concentrating on the subject associated mycoflora with root drug of *S. xanthocarpum* and deterioration of chemical constituents due to spoilage, therefore, this investigation was carried out to determine the percentage incidence of fungi associated with roots of *S. xanthocarpum* stored at different relative humidities and also determined the changes in quality and quantities of chemical constituent amounts in relation to fungal contamination.

MATERIAL AND METHODS

The root samples were collected from different localities and were brought to the laboratory in polyethylene bags to avoid aerial other contaminations as soon as and then were dried in the shade. According International Seed Testing Association[7] Moist Blotter test and Agar plate method were done for isolation and identification of associated mycoflora. For isolation of associated fungal; root samples sterilized with 2% sodium hypochlorite solution for some minutes and thoroughly washed with sterilized distilled water. After developing of colonies, were counted and average of 10 Petri plates were calculated. Fungi were identified by using references[1, 14, 15]. Some

part of root samples were stored in small muslin clothes in desiccators at 30, 50, 75, 96 and 100 % RH for 90 days in the room temperature The root samples were taken out an internal 15, 30, 45, 60, 75 and 90 days, thoroughly washed with distilled water and plated in Petri plates. The isolation of mycoflora was recorded from first day to 60th day of storage. Some part of samples after drying in oven, finely grinded for evaluation of changes in biochemical constituents related to mycoflora. Quantitative estimation of chemical constituents was carried out from first day to 90th day of incubation. Biochemical analysis were estimated by the standard procedure[5, 10, 11, 18]. Simple correlation were run between selected parameters using Statistical Package for Social Science (SPSS) software in which statistical significance was determined at 0.05 % probability levels.

RESULTS

Total 18 fungi were isolated from the roots of *Solanum xanthocarpum* which included: *F. reticulatum*, *F. oxyspor*um, *F. solani*, *F. semitectum*, *Papulaspora immerse*, *Theilavia terricola*, *A. fumigatus*, *Drechslera bicolor*, *Mucor praini*, *Scytallidium thermophilum*, *Chaetomium spirale*, *Monilia sitophila*, *Didymostilbe* sp., *Trichoderma* sp., *A. terreus*, *Chaetomium* sp. and *A. parasiticus*. The root samples stored at various relative humidities and percentage incidences of total fungi calculated. Total percentage incidence of fungi after 15 days of incubation under 30 % RH recorded 0.82%, this amount gradually increased to 2.58% on 60th days of incubation, similarly, this increasing in amount of percentage incidence observed under 50, 75 and 96% RH and finally the higher percentage incidence occurred under 100 % RH and from 15 to 60 days of incubation, the % incidence increased from 3.08 to 21.79% (Table1).

The roots of *S. xanthocarpum* contained 7.24 % total protein this value decreased to 4.31 % when this drug stored at different relative humidity and different incubation days. The drug stored under 30, 50, 75, 96 and 100 % RH showed the deterioration of protein contents 7.23, 5.83, 5.30%; 7.11, 5.56, 5.02%; 7.09, 5.43, 4.72%; 6.94, 4.87, 4.44% and 6.66, 4.75, 4.31% after 30, 60 and 90 days of incubation period, respectively (Table 2).

The roots of *S. xanthocarpum* in fresh condition contained 2.92 % total phenol content (Table 3). A gradual decrease in total amount of protein observed at all tested 30, 50, 75, 96 and 100 % RH. Total values of phenols observed 2.61 and 2.51% after 15 days of incubation and under 30 and 50 % RH, these amounts reduced to 1.77 and 1.61% after 90 days of incubation period. In cases of 96 and 100% RH, the values showed more reduction in total amount of phenol after 15 days to 90 days of storage; 2.30, 2.24% to 1.22 and 1.02%, respectively.

Root samples of *S. xanthocarpum* stored at various relative humidity and various incubation days, the samples which stored at 30 % RH after 15 days of incubation showed 8.37% in total alkaloids, this value deteriorated to 8.15% after 90 days of incubation. In case of 50 % RH also observed the deterioration of alkaloid content, the drug stored for 30, 60 and 90 days of showed 8.33, 8.17 and 8.006% deterioration of alkaloid. In case of 75 % RH also observed 8.33, 8.29, 8.30, 8.096, 8.05, 7.90% loss of alkaloid content after the storage of 15, 30, 45, 60, 75 and 90 days, respectively. Similarly, in case of 96% RH also observed deterioration of alkaloid contents 8.29, 8.23, 8.19, 8.011, 8.076, 8.084% after all tested relative humidity. Lastly the drug stored at 100% RH showed the 8.23, 8.19, 8.083, 8.023, 7.97, 7.75% deterioration of alkaloid content after the 15, 30, 45, 60, 75 and 90 days of storage(Table 4).

In case of changes in total glycosides amounts after 15 days of storage total value of glycosides recorded to 5.60, 5.58, 5.56, 5.50, 5.38%; these values deteriorated to 3.96, 3.86, 3.58, 3.50, 3.34 after 90 days of storage period, respectively (Table 5).

Data analysis showed reduction of chemical constituents under influence of relative humidity and different incubation period were significant at 5% level of significance according to multivariate data analysis (P value <0.05).

DISCUSSION

From the result observed maximum storage period and high relative humidity proliferate the growth of fungi and they influenced on chemical constituent's contents considerably. Maximum reduction

in total proteins, phenols, glycosides and alkaloids contents was recorded after 60th of storage where percentage incidence of fungi was also maximum. Significant reduction of all selected chemical constituents contents were noticed at above 75% RH and prolonged incubation periods (after 45 days). The result indicates that the quality of herbal drugs may be retained by storage condition at lower RH (below 50% RH) and short storage period. Changes in chemical constituents may be due to the active interference of fungi in breakdown of constituents and utilization by them. Several workers have been showed deterioration of chemical constituents under storage due to spoilage of fungi in different plants[2, 3, 4, 6, 9, 10, 12]. So that from this results have concluded that the maximum storage period is responsible for the maximum association of fungi and their growth on roots and continuously reduction of medicinal values.

ACKNOWLEDGEMENT

Authors thank to the head of the Department of Botany, University of Pune for providing necessary facilities and encouragement.

Table 1

Percentage incidence of fungal isolated from the root of *Solanum xanthocarpum* stored at various relative humidity

Mycoflora	con	30%				50%				75%				96%				100%			
		15	30	45	60	15	30	45	60	15	30	45	60	15	30	45	60	15	30	45	60
F. solani	0.20	0.31	0.83	0.10	0.52	0.10	0.93	0.31	0.83	0.20	1.56	0.93	1.14	0.41	1.45	1.87	2.60	0.52	1.77	2.08	3.33
F. oxysporum	0.10	0.41	0.10	0.31	0.83	0.20	0.31	0.52	0.93	0.52	0.52	0.72	1.56	0.72	0.62	0.93	1.66	1.04	1.35	1.04	1.87
F. semitectum	-	-	-	0.10	0.31	-	-	0.20	0.83	0.20	0.10	0.52	0.93	0.10	0.10	0.72	1.56	0.20	0.31	0.83	1.77
F. reticulatum	-	-	-	-	-	-	-	-	-	-	-	-	0.20	-	-	0.10	0.31	0.10	0.20	0.20	0.52
Aspergillus fumigatus	0.10	0.10	0.10	0.20	0.10	0.10	0.10	0.41	0.52	0.20	0.31	0.51	0.93	0.41	0.72	0.72	1.56	0.52	1.04	0.93	2.60
Papulaspora immerse	-	-	-	-	-	0.10	-	-	-	-	-	0.10	-	-	0.20	0.20	0.31	0.10	0.41	0.31	0.52
Theilavia terricola	-	-	-	-	0.10	-	-	-	0.20	-	-	0.10	0.52	-	-	0.10	0.72	0.10	0.20	0.31	0.93
Drechslera bicolor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.20	-	0.10	0.10	0.41
Curvularia lunata	-	-	-	-	-	-	-	-	0.10	-	-	0.10	0.52	-	-	0.20	0.72	0.10	0.10	0.31	1.56
Mucor praini	0.10	-	-	-	-	-	-	-	-	0.10	-	-	0.72	-	-	0.31	0.93	0.10	0.20	0.52	1.56
Scytallidium thermophilum.	-	-	-	-	0.72	-	0.10	-	0.93	-	-	0.10	1.14	0.10	0.10	0.31	1.25	0.10	0.20	0.52	1.45
Chaetomium spirale	-	-	-	-	-	-	-	-	-	-	-	-	0.20	-	-	-	0.31	-	-	0.10	0.31
Monilia sitophila	-	-	-	-	-	-	-	-	-	-	-	-	0.10	-	-	-	0.51	-	-	0.10	0.72
Didymostilbe sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.20	-	-	-	0.31
Trichoderma sp.	0.20	-	-	0.10	-	-	-	0.31	0.52	-	0.20	0.52	2.08	-	0.31	0.93	2.60	0.10	0.52	1.14	2.91
Aspergillus terreus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.10	0.20	0.10	0.10	0.10	0.31
Chaetomium sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.10	-	-	0.10	0.20
Aspergillus parasiticus	-	-	-	-	-	-	-	-	0.10	-	-	-	0.21	-	-	-	0.31	-	-	-	0.51
Total	**0.7**	**0.82**	**0.81**	**0.81**	**2.58**	**0.5**	**1.44**	**1.75**	**4.96**	**1.22**	**2.69**	**3.6**	**10.2**	**1.74**	**3.5**	**6.49**	**16.05**	**3.08**	**6.5**	**8.69**	**21.79**

Table 2

Deterioration of proteins content (mg/100mg) in root of *Solanum xanthocarpum* at different relative humidities

Incubation days	Control	30%	50%	75%	96%	100%
1 day	7.24±0.050	7.24±0.050	7.24±0.050	7.24±0.050	7.24±0.050	7.24±0.050
15 days	7.20 ± 0.21^{d}	7.36 ± 0.008^{c}	7.26 ± 0.050^{d}	7.19 ± 0.034^{c}	7.06 ± 0.080^{a}	6.83 ± 0.057^{a}
30 days	7.27 ± 0.32^{d}	7.23 ± 0.060^{c}	7.11 ± 0.65^{cd}	7.09 ± 0.065^{c}	6.94 ± 0.071^{b}	6.66 ± 0.088^{a}
45 days	7.23 ± 0.39^{d}	7.097 ± 0.013^{d}	7.06 ± 0.021^{c}	6.95 ± 0.084^{b}	6.68 ± 0.076^{b}	6.54 ± 0.021^{a}
60 days	7.25 ± 0.001^{d}	5.83 ± 0.34^{d}	5.56 ± 0.13^{c}	5.43 ± 0.13^{bc}	4.87 ± 0.34^{a}	4.75 ± 0.073^{a}
75 days	7.25 ± 0.012^{d}	5.56 ± 0.060^{d}	5.29 ± 0.16^{cd}	5.13 ± 0.14^{b}	4.55 ± 0.14^{ab}	4.41 ± 0.021^{a}
90 days	7.24 ± 0.69^{d}	5.30 ± 0.15^{d}	5.02 ± 0.073^{c}	4.72 ± 0.19^{bc}	4.44 ± 0.028^{a}	4.31 ± 0.12^{a}

Table 3

Deterioration of phenols content (mg/100mg) in root of *Solanum xanthocarpum* at different relative humidities

Incubation days	Control	30%	50%	75%	96%	100%
1 day	2.92±0.008	2.92±0.008	2.92±0.008	2.92±0.008	2.92±0.008	2.92±0.008
15 days	2.98 ± 0.084^{d}	2.61 ± 0.074^{c}	2.51 ± 0.081^{c}	2.36 ± 0.030^{b}	2.30 ± 0.022^{a}	2.24 ± 0.060^{a}
30 days	2.94 ± 0.36^{d}	2.55 ± 0.019^{c}	2.46 ± 0.079^{c}	2.30 ± 0.03^{b}	2.26 ± 0.21^{ab}	2.18 ± 0.074^{a}
45 days	2.94 ± 0.30^{d}	2.38 ± 0.097^{c}	2.36 ± 0.10^{c}	2.18 ± 0.13^{b}	1.92 ± 0.10^{a}	1.77 ± 0.119^{a}
60 days	2.90 ± 0.78^{c}	2.30 ± 0.10^{c}	2.16 ± 0.063^{c}	1.98 ± 0.019^{b}	1.90 ± 0.085^{ab}	1.61 ± 0.097^{a}
75 days	2.94 ± 0.014^{c}	2.18 ± 0.052^{c}	2.10 ± 0.039^{b}	1.92 ± 0.109^{ab}	1.75 ± 0.108^{a}	1.39 ± 0.097^{a}
90 days	2.90 ± 0.25^{c}	1.77 ± 0.13^{c}	1.61 ± 0.16^{b}	1.41 ± 0.11^{ab}	1.22 ± 0.27^{a}	1.02 ± 0.12^{a}

Table 4

Deterioration of total alkaloids content (mg/100mg) in root of *Solanum xanthocarpum* at different relative humidities

Incubation days	Control	30%	50%	75%	96%	100%
1 day	8.38±0.91	8.38±0.91	8.38±0.91	8.38±0.91	8.38±0.91	8.38±0.91
15 days	8.38±0.10^{b}	8.37±0.10^{a}	8.36±0.10^{a}	8.33±0.29^{a}	8.29±0.11^{a}	8.23±0.13^{a}
30 days	8.38±0.09^{b}	8.35±0.90^{b}	8.33±0.14^{a}	8.29±0.11^{a}	8.23±0.13^{a}	8.19±0.13^{a}
45 days	8.37±0.14^{b}	8.30±0.10^{ab}	8.26±0.096^{ab}	8.30±0.15^{ab}	8.19±1.20^{ab}	8.083±0.11^{a}
60 days	8.36±0.15^{c}	8.26±0.078^{bc}	8.17±0.11^{ab}	8.096±0.10^{ab}	8.011±0.098^{ab}	8.023±0.18^{a}
75 days	8.35±0.16^{c}	8.20±0.081^{bc}	8.10±0.091^{ab}	8.05±0.11^{ab}	8.076±0.13^{ab}	7.97±0.11^{a}
90 days	8.35±0.16^{d}	8.15±0.10^{c}	8.006±0.075^{bc}	7.90±0.025^{ab}	8.084±0.066^{ab}	7.75±0.052^{a}

Table 5

Deterioration of total glycosides content (mg/100mg) in root of *Solanum xanthocarpum* at different relative humidities

Incubation days	Control	30%	50%	75%	96%	100%
1 day	5.60±0.01	5.60±0.01	5.60±0.01	5.60±0.01	5.60±0.01	5.60±0.01
15 days	5.60±0.017^{b}	5.60±0.011^{b}	5.58±0.015^{b}	5.56±0.015^{ab}	5.5±0.015^{ab}	5.38±0.015^{a}
30 days	5.58±0.025^{d}	5.47±0.015^{c}	5.32±0.049^{c}	5.28±0.081^{c}	5.11±.026^{b}	5.02±0.015^{a}
45 days	5.55±0.090^{d}	5.4±0.1^{c}	5.22±0.049^{b}	5.17±0.049^{b}	4.96±0.05^{a}	4.91±0.015^{a}
60 days	5.53±0.11^{d}	4.9±0.01^{d}	4.79±0.055^{cd}	4.69±0.22^{bc}	4.11±0.15^{ab}	3.8±0.10^{a}
75 days	5.49±0.016^{c}	4.2±0.18^{b}	4.01±0.14^{b}	3.62±0.27^{a}	3.59±0.20^{a}	3.50±0.18^{a}
90 days	5.45±0.14^{c}	3.96±0.052^{b}	3.86±0.096^{b}	3.58±0.010^{a}	3.50±0.12^{a}	3.34±0.16^{a}

Data in tables 2,3,4,5 are the mean of three replicates ± standard deviation. P- Value denoted the significance of differences between the mean by univariate comparison statistics. The value followed by different letters differ significantly by Duncan's multiple rang test at P=Sig= 0.05

REFERENCES

1. Barnet HL and Hunter BB: Illustrated Genera of Imperfect Fungi. Minneapolis Burgress Publishing Company. Minneapolis; 1972.

2. Bilgarmi KS, Sinha RK and Prasad T: Effect of fungal flora on the seed contents of moong. Indian Phytopatho 1978; 31: 476-479.

3. Deokule SS and Kabnoorkar PS: Studies on phytochemical constituents of drug Punarnava under storage condition due to fungi. J. I. B. S. 2008; 87(3&4): 256 - 261.

4. Dutta GR and Roy AK: Mycoflora associated with *Strychnous* seed deterioration of their active principles under storage, Indian Phytopath 1987; 40 (4): 520.

5. Harborne JB: Phytochemical methods – London. New York, Chapman & Hall. 1973:39 – 42.

6. Inman RE: Disease development, disease intensity and Carbohydrate levels in rusted bean plants, Phytopath 1962; 52; 1207.

7. International seed testing association. International rules for seed health testing, Proc. International seed test assoc. 1966: 31; 1.

8. Joy, PP, Thomas J, Mathew S and Skaria BP: Medicinal Plants. Kerala Agricultural University. 1988; 2:32-35.

9. Kabnoorkar PS and Deokule SS: Studies on changes in chemical constituents roots of *Boerheavia diffusa* infested with *Aspergillus parasiticus* and *A. niger* under storage. Geobios 2009; 36: 206-210.

10. Kokate CK, Purohit AP and Gokhal SB: Pharmacognosy, Nirali Prakashan 18th Ed. 2002; 238.

11. Lowry OH, Rosenberg NJ, Fan AL and Randal RF: Protein measured with the folin-ciocalteu reagent, J. Biol. Chem 1951; 193: 265.

12. Marx AF, Beck HC, Vananderwaard WF and Flines J: Microbial deterioration of materials. In '*Microbial biodeterioration*' (ed A.H. Rose) Academic press London, 1966.

13. Nadkarni AK: Indian Materia Medica. 3th edition Dhootapapeshwar, Prakashan. 1954: 1319.

14. Nelson PE, Tossoum TA and Marasa WFO: Fusarium Species. An Illustrated

Manual for Identification . The Pennsylvania State University Press. U. S. A. 1983; 193.

15. Raper KB and Thomas CA: manual of Penicillia Williams and Wilkins. Battimore, 1949: 850.

16. Roy AK, Chourasia HK and Kumari N: Association of mycoflora with some crude herbal drug of Bhutan. Indian Bot. Reptr 1987; 6(1): 48.

19.

17. Salar RK and Suchitra: Evaluation of antimicrobial potential of different extracts of *Solanum xanthocarpum* Schrad and Wednl. African Journal of Microbiology Research. 2009; 3(3): 97-100.

18. Singh M, Singh SS and Sanwal GG: A new colorimetric method for the determination of phenolics, Indian J. Exp. Biol 1978; 16(4); 712.