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Research Article

IMPACT OF DRYING METHODS ON THE ANTIOXIDANT ACTIVITY AND CHEMICAL COMPOSITION OF TECOMA PLANT EXTRACTS

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ABSTRACT

According to the World Health Organization (WHO), 80% of the world's population relies on traditional medicine, particularly plant-based drugs, for primary health care. This study investigates the distribution of chemical constituents in various parts of the Tecoma plant and their antioxidant activities. The antioxidant potential was assessed using the DPPH free radical scavenging method, determining the maximum percentage inhibition of DPPH radicals by different extracts from various parts of Tecoma under different drying conditions. The results indicated that drying significantly affects the antioxidant activity of Tecoma. Shade-dried parts exhibited superior activity compared to those dried in the sun or hot air oven. This finding underscores the importance of drying methods in preserving the medicinal properties of Tecoma, highlighting the role of traditional processing techniques in maintaining the efficacy of plant-based treatments. These insights contribute to the broader understanding of how preparation methods influence the therapeutic potential of medicinal plants, reinforcing their value in primary health care systems worldwide.

Keywords:-World Health Organisation (WHO), Tecoma, antioxidant, traditional medicine..

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INTRODUCTION

Plants play a pivotal role in healthcare, with the World Health Organization (WHO) reporting that 80% of the world's population relies on traditional medicine, particularly plant-based drugs, for primary health care. India, with its rich heritage, has a long history of using herbal drugs within officially recognized alternative health systems, including Ayurveda, Yoga, Unani, Siddha, Homeopathy, and Naturopathy. Spices, integral to civilization, exploration, and commerce, are universally accepted not only as condiments and flavor enhancers but also for their medicinal properties. According to Hirasa and Takemasu, a spice can be defined as the dried part of a plant, such as roots, leaves, and seeds, which imparts a distinct flavor and pungent stimulus to food. [1] Spices are a repository of numerous chemically active compounds that provide flavor, fragrance, and piquancy. Most spices derive their flavoring properties from volatile oils and, in some cases, fixed oils and small amounts of resin, collectively known as oleoresins. The phytochemicals in spices, which are secondary metabolites, serve to protect the plant from herbivorous insects, vertebrates, fungi, pathogens, and parasites. [2] The quality of spices is assessed based on intrinsic and extrinsic characteristics. Intrinsic quality pertains to the retention of chemical principles like volatile oil, alkaloids, and oleoresins, while extrinsic quality emphasizes physical characteristics.

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Each spice-importing country has developed specific quality requirement specifications or adopted international standards. Cleanliness specifications for spices from the American Spice Trade Association (ASTA) are universally adopted for physical quality assessment, and the United States Food and Drugs Administration (USFDA) also provides quality requirements for spices. [3] Post-harvest technology, particularly drying, is a crucial step in the processing of spices. Despite technological advancements, traditional open sun drying remains prevalent among farmers. Harvested spices are often spread on mats, cement floors, rooftops, or even on soil along roadsides to dry under solar intensity. Tecoma stans, commonly found in human-disturbed areas such as abandoned fields and yards, as well as along the edges of dry broadleaf evergreen formation-shrublands, grows in both sand and limestone substrates. [4] Almost all parts of Tecoma stans have medicinal importance and are traditionally used to treat various ailments. Therefore, this study aims to devise post-harvest technology methods to enhance the export quality of Tecoma, focusing on improving its drying process to ensure the retention of its valuable chemical properties.

MATERIALS AND METHODS

Post-harvest drying

Fresh Tecoma plants were collected and various parts like leaves, stems, fruits and roots were separated. These parts were individually dried under following conditions

a. Sun dried at 45^0c
b. Shade dried at room temperature (25-30^0c)
c. Hot air oven at 40-45^0c.

After ensuring complete drying for 2days the plant material was ground and powdered and tested for physical parameters.

Physical parameters

Determination of loss on drying

Moisture is an inevitable component of crude drugs, which must be eliminated as far as practicable. Drying plays a very important role in the quality as well as purity of the material. [5] Moisture will lead to the activation of enzymes and gives suitable condition, to the proliferation of microorganisms.

METHOD

About 2g of the drug was weighed in a watch glass, kept in hot air oven at 1050C and dried for a period until constant weight was obtained. Weight loss on drying was noted and difference in weight indirectly relates the moisture content of powdered drug. Total loss on drying of leaf powder was noted.

Determination of ash values

Ash value aids in determination of quality and purity of crude drug in powdered form. [6] Ash contains inorganic salts like phosphates, carbonates and silicates of sodium, potassium, magnesium, calcium are adhere to it or may also be added to for the purpose of adulteration. Hence ash determination furnishes a basis for judging the identity and quality of the drug gives information to its adulteration with inorganic matter. [7] Ash standards have been established for a number of drugs in the pharmacopoeias.The acid insoluble ash is a part of ash is imposed, especially in case where silica and calcium oxalate content of the drug is very high. In most of the cases inorganic matter is present in small amounts which are not objectionable if only traces are present.

- **Determination of total ash value**

Weigh accurately 3g of the powdered material in a silica crucible which was previously ignited and weighed. The powdered material was spread as a fine even layer at the bottom of the crucible. [8] The crucible was incinerated until a red hot material was obtained at 4500C temperature and it is free from carbon. The crucible was cooled and weighed. The procedure was repeated until the constant weights.

- **Determination of acid insoluble ash value**

The obtained total ash was boiled with 25ml of 2N HCl for 5 min. The insoluble ash was collected on ash less filter paper. The insoluble ash was transferred into pre-weighed silica crucible, ignited, cooled and weighed. The procedure was repeated till the constant weight was obtained. [9]

- ***Determination of water soluble ash value***

The total ash obtained was boiled with 25ml of chloroform water for 5 min. The insoluble matter was collected on a ash less filter paper and washed with hot water. The insoluble ash was transferred into pre-weighed silica crucible, ignited for 15 min at a temperature at 4500c, cooled and weighed. The procedure was repeated to get the constant weight. The weight of the insoluble matter was subtracted from the weight of total ash.

The percentage of ash was calculated with reference to the air-dried sample drug.

RESULTS

Studies on loss on drying and ash values were performed and the results were tabulated in table 1.

PHYTO CHEMICAL INVESTIGATIONS

Extraction

50g of powdered material of each part of the Tecoma plant was extracted separately using methanol using soxhelt apparatus. The extract was concentrated

and traces of the solvent were completely removed under reduced pressure and stored in vacuum desiccators for further use.

Preliminary Phytochemical analysis

The concentrated extracts were subjected to chemical tests for the identification of the various constituents as per the standard procedures in Kokate.

Detection of Alkaloids

Small portions of solvent-free chloroform, alcohol and aqueous extracts were stirred separately with a few drops of dilute hydrochloric acid and filtered. [10] The filtrate was tested with various alkaloidal reagents.

a. Mayer's test: Filtrates were treated with potassium mercuric iodide (Mayer's reagent) and the formation of cream colored precipitate was indicates the presence of alkaloids.

b. Dragendroff's test: Filtrates were treated with potassium bismuth iodide (Dragendroff's reagent) and formation of reddish brown precipitate was indicates the presence of alkaloids.

c. Wagner's test: Filtrates were treated with solution of iodine in potassium iodide (Wagner's reagent) and formation of brown precipitate was indicates the presence of alkaloids.

d. Hager's test: Filtrates were treated with a saturated solution of picric acid (Hager's reagent) and formation of yellow precipitate was indicates the presence of alkaloids.

Determination of Total Phenolic Content

The total phenolic content was determined using Folin–Ciocalteu reagents with analytical grade gallic acid as the standards.

Standard curve of gallic acid

1mg of gallic acid was weighed and dissolved in 100ml of distilled water and successive dilutions were made to make up the concentrations 2,4,6,8 and 10 µg/ml. A volume from above aliquots was taken and mixed with 1.25ml of FC reagent. It was left for 5 mins. Then 2.5ml of 20% sodium carbonate was added and it was let to react for 30 min then the volume was made upto 10ml. Then the absorbance was measured at 765nm. The calibration curve was drawn plotting the absorbance and concentrations.

Sample preparation

0.5g of Methanol extract was weighed and dissolved in 100ml of water. From this 0.1ml was taken into 10ml standard flask and 1.25ml of FC reagent was added and let to react for 5 min. Then 2.5ml of 20% sodium carbonate was added and the volume was made upto 10ml. It was kept for 30 min for complete reaction. Now the absorbance was measured at 765nm. [11] Total phenolic content was calculated from the calibraition curve of gallic acid and the value was expressed in gallic acid equivalents.

Preliminary phytochemical screening

Methanol extract of various parts of Tecoma have been investigated for the presence of phyto constituents by performing preliminary phyto chemical screening. Results show the presence of polyphenols, flavonols, carbohydrates, proteins and glycosides in all the parts irrespective of the drying.

Total Phenol and flavonoid content

The total phenol content and total flavonoid content of extracts of various parts of Tecoma were determined using the standard graphs of gallic acid with r^2=0.988 and quercetin r^2=0.998 which are given in figures.

Table:1 Physical parameters of various parts of Tecoma

Drug sample	Drying type	Loss on drying (%w/w)	Ash values (%w/w)		
			Total ash	Acid insoluble ash	Water soluble ash
leaves	Sun dried	1.32	4.18	1.54	2.41
	Shade dried	6.32	4.22	1.48	2.34
	Hot air oven dried	4.32	4.23	1.56	2.31
Stems	Sun dried	2.32	4.55	1.65	2.78
	Shade dried	9.38	4.85	1.54	2.56
	Hot air oven dried	6.43	4.79	1.52	2.61
Roots	Sun dried	5.29	6.06	2.46	3.18
	Shade dried	12.43	6.05	2.41	3.04

	Hot air oven dried	6.04	6.03	2.55	3.15

Table: 2 Total phenol content and total flavonoid content

Sl. No.	Sample	Drying	Total phenol content (mg gallic acid eq's / g extract)	Total flavonoid content (mg quercetin eq's / g extract)
1.	Leaves	Sun (SDL)	54.98	8.45
		Shade (SHL)	53.77	14.37
		Hot air oven (HDL)	21.12	5.46
2.	Roots	Sun (SDR)	19.02	8.88
		Shade (SHR)	35.66	12.54
		Hot air oven (HDR)	16.33	8.27
3.	Stems	Sun (SDS)	31.78	10.17
		Shade (SHS)	59.48	17.14
		Hot air oven (HDS)	29.37	9.64

Figure 1: Soxhlet extraction

Figure 1.1: Various extracts of A. leaves, B. Stems, C. Roots		
A	**B**	**C**

Figure 1.2: Standard curve of gallic acid.

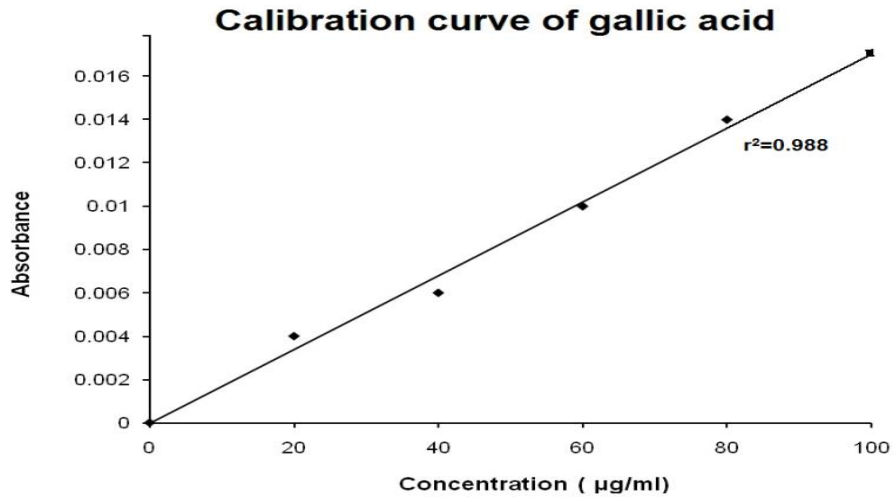
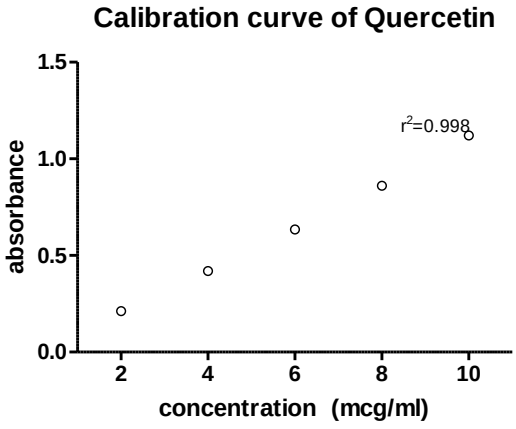


Figure 1.3: Standard curve of quercetin



DISCUSSION

Considering each and every step under post-harvest technology of spices, drying remains the most important operation. [12] At the time of harvesting, spices like all other agricultural commodities invariably contain high moisture that must be brought down into the desired level at which attack of micro-organisms would be minimum.The removal of moisture is attained either naturally or artificially by heat or pressure. Thermal mode of drying is more prevalent and most studied.

However the percentage moisture content of spices varies considerably at the time of harvest. [13] The direct exposure to the sun destroys colour, vitamins and flavour, and there is chance of contamination with dust, dirt, insect infestation, and contact with other pests.

Tecoma is one of the important spices known for its significant use as flavoring agent, carminative. It is proven to treat cancer, diarrhea and pocess antimicrobial, antifungal, hepato protective activities. [14] Moreover Tecoma plant is well known for its rich source of quercetin but the content varies in the plant in response to the minor changes in environment. The post harvest treatment of the plant also determines the quercetin content.

Studies on loss on drying and ash values were performed and the results were under limits. Methanol extract of various parts of Tecoma have been investigated for the presence of phyto constituents by performing preliminary phyto chemical screening. [15] Results show the presence of polyphenols, flavonols, carbohydrates, proteins and glycosides in all the parts irrespective of the drying.From the results it was understood that drying also plays important role in determining the activity irrespective of the part. All the shade dried parts showed better activity compared to sun dried ad hot air oven dried parts. Drying had a significant effect on the antioxidant activity of the Tecoma plant.

CONCLUSION

Tecoma is one of the important spices known for its significant use as flavoring agent, carminative. It is proven to treat cancer, diarrhea and possess antimicrobial, antifungal, hepat-protective activities. Moreover Tecoma plant is well known for its rich source of quercetin but the content varies in the plant in response to the minor changes in environment. The post harvest treatment of the plant also determines the content of chemical constituents. The environment is such a factor that it cannot be controlled or maintained in a cost effective way. So issues to maintain postharvest technologies aiming in better yield are of concern. Thus drying has been selected as a primary post harvest parameter and procedures were to be developed to validate the yield and activity of different parts of Tecoma. From the results it was understood that Drying had a significant effect on the antioxidant activity of the Tecoma plant. All the shade dried parts showed better activity compared to sun dried ad hot air oven dried parts. Further steps have to be developed to estimate the effect of drying on individual chemical constituent using accurately reliable methods like HPLC and GC. Investigations on the distribution of chemical constituents in various parts of Tecoma are also to be performed.

REFERENCES

1. Alam MN, Bristi NJ, Rafiquzzaman M. (2013). Review on in vivo and in vitro methods evaluation of antioxidant activity. *Saudi pharmaceutical journal.*1, 21(2), 143-52.
2. Aleemuddin, Karthikeyan. (2012). Invitro anthelmintic activity of different extracts of Tecoma procumbens, *Scholars Research Library*, J. Nat. Prod. Plant Resour, 2(2), 267-271.
3. Aleemuddin, M.A., Karthikeyan M and Rajasekar,S.(2011).Tecomaprocumbens Linn- A phytopharmacological review. *Int. J.Pharma. Sci.* Rev. Res. 11,133-136.
4. Boulekbache-Makhlouf L, Medouni L, Medouni-Adrar S, Arkoub L, Madani K. (2013). Effect of solvents extraction on phenolic content and antioxidant activity of the byproduct of eggplant. Industrial Crops and Products.1,49, 668-74.
5. Cetin B, Ozer H, Cakir A, Polat T, Dursun A, Mete E, Oztürk E, Ekinci M. (2010). Antimicrobial activities of essential oil and hexane extract of Florence fennel [Foeniculum vulgare var. azoricum (Mill.) Thell.] against foodborne microorganisms. *J Med Food*. 13(1), 196-204.
6. Ganesan, Mathuram Venkatanarasimhan, (2013). Hepatoprotective Effect Of Tecoma Procumbens Linn Against D-Galactosamine Induced Acute Liver Damage In Rats, *International Journal of Integrative sciences, Innovation and Technology*, 2(2), 9-11.
7. Hadzri HM, Yunus MA, Zhari S, Rithwan F. (2014). The effects of solvents and extraction methods on the antioxidant activity of *P. niruri. J. Teknol. Sci.* Eng.9, 68, 47-52.
8. Hemphill.(2000) . Spice notes - A cooks compendium of herbs and spices. Pan McMillan, Sydney
9. Joy, C.M. and Jose, K.P. (1998a). Solar energy for drying. Spice lndia (Malayalam), Spices Board (Govt. of lndia). 11(8), 315-16
10. Kokate CK. Practical Pharmacognosy. New Delhi: Vallabh Prakashan;1999, 107.
11. Kokate CK. Practical Pharmacognosy. New Delhi: Vallabh Prakashan;1999, 107.

12. Kordylas, J.M. (1991). Processing and preservation of tropical and sub-tropical foods. ELBS with McMillan. Hampshire.199-217
13. Krishnarao Mangeshrao Nadkarni,.Nadkarni A. K. (1955). Indian material medica, Bombay, Popular Book depot,3(1), 371.
14. Lavanya, Uma Maheshwari, Harish, (2010). In-vitro anti-oxidant, anti-inflammatory and anti-arthritic activities in the leaves of Tecoma procumbens Linn, *Research Journal of Pharmaceutical, Biological and Chemical Sciences*. 1(4), 753.
15. Lillian Barros, Sandrina A. Heleno, Ana Maria Carvalho, Isabel C.F.R. Ferreira, (2009). Systematic evaluation of the antioxidant potential of different parts of Foeniculum vulgare Mill. from Portugal, Food and Chemical Toxicology. 47, 2458–2464

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