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Standardization of aqueous and hydroalcoholic extracts of fennel, amla and tulsi for neuropharmacological activities

Bhawna Sridhar[1, 2*], Sushil Kumar[1]
[1] School of Pharmaceutical Sciences, IFTM University, Lodhipur Rajput, Delhi Road, Moradabad, Uttar Pradesh, India
[2] Faculty of Pharmacy, Moradabad Educational Trust Group of Institutions, Moradabad, Uttar Pradesh, India

Abstract
As of late more individuals all through world are going to utilize natural items in medical services framework. Overall need of alternative medication has brought about development of herbal products markets and interest in traditional systems of medicine. Numerous epidemiological investigations directed in India on mental and conduct issues report changing commonness rates, going from 9.54 to 370 for each 1000 population. Researchers are developing medications to treat a wide range of neurological disorders including pain, neurodegenerative sicknesses like Parkinson's illness and Alzheimer's infection, mental issues, habit and numerous others. Active constituent in the herbal combination go act as synergistic way. So best combination of herbs mixture gives higher action against a disease. Additionally, poly-herbal formulation grown detailing having numerous therapies against an illness so various molecules cure a disease by various mechanism to give a total treatment against an infection condition. Based on the traditional claims of the herbal plants and the reported activities, the aim of this article is to investigate the standard parameters of herbal plants utilized for the preparation of polyherbal formulations for neuropharmacological activity, with their safety and efficacy. Worldwide there is a demand that the young researchers for future exploration to protect human beings from different sorts of sicknesses and May fills in as a natural gold for the advancement of humankind.

Keywords: *Foeniculum vulgare*, *Emblica officinalis*, *Ocimum sanctum*, herbal plant, physicochemical parameters, phytochemical screening

Introduction

Standardization of herbal plants is essential to evaluate the quality and value of drugs, based on the concentration of their active principle, physical, chemical, physcio-chemical standardization and *in vitro*, *in-vivo* parameters [1]. Natural products have been our single best wellspring successful source of medicines. Each plant factory capable of synthesizing unlimited no. of highly complex and unusual chemical substance. It is important to maintain reproducible efficacy and safety of phytopharmaceutical in this way if phytopharmaceutical need to view as rational medication then it should be standardized and pharmaceutical drug quality should be approved. WHO focuses on the significance of the qualitative and quantitative methods for characterizing the samples, quantification of the biomarkers or chemical markers and the fingerprint Profiles. If a principle active component is known, it is most logical to evaluate this compound. Where active ingredients contributing to therapeutic efficacy are known as mentioned in the table 1, botanical preparations should be standardized to their compounds; where the active ingredients are not yet known, a marker substance which ought to be explicit for the organic or herbal plants, are picked for analytical purpose [2].

Neuropharmacological Disorder

Anxiety is involved in various psychiatric disorders, such as depression, panic attacks, phobias, generalized anxiety disorder, obsessive-compulsive disorder and post-traumatic stress disorder [3]. Anxiety disorders are the most common class of neuropsychiatric disorders in USA and numerous different countries [4, 5]. Stress basically is a reaction of mind and body against change in the homeostasis [6]. Stress alters the equilibrium of various hormones, which have a significant impact on the immune response. During stressful condition, neuroendocrine hormones like adrenocorticotropic hormone, cortisol, norepinephrine and epinephrine are released and they can alter immune functions and, in this way, alter the course of immune based disease [7]. Depression is nothing but only the state of mind and mood disorder. 25% of women and 12% of men are suffering due to depression [8]. To treat the depression, antidepressant drugs are utilized. They act on the central monoaminergic systems, 5-HT and nor-adrenergic synaptic neurotransmissions mainly. Selective serotonin reuptake inhibitors and noradrenaline reuptake inhibitors are also showing the best results in treating mental disorders [9]. The major cause for the neurodegenerative diseases and mental Disorders is stress [10].

Table 1: Description of fennel, amla and tulsi in the treatment of neuropharmacological disorder

Biological name	***Foeniculum vulgare***	***Emblica officinalis***	***Ocimum sanctum***
Family	Apiaceae	*Phyllanthaceae*	Lamiaceae.
Common Name	Saunf	Amla	Tulsi
Part Used	Fruit	Fruits	Aerial

Mechanism of action	1. The significant component of the essential oil, anethole has been reported to show a potent estrogenic activity. There is a relationship between decrease estrogen levels and increase anxiety. Furthermore, anethole has a structural similarity with dopamine [11, 13]	1. It is one of the significant constituents of the polyherbal formulation NR-ANX-C & "Triphala", an Ayurvedic formulation known for its rejuvenating properties [16, 17].	1. Tulsi decreases the effects of acute and chronic noise-induced stress in experimental animals, with increment of neurotransmitter and oxidative stress levels in discrete brain regions along with improved immune, ECG and corticosteroid responses [20, 22].
	2. Also generation of oxidative stress, indicated by decrease in levels of endogenous antioxidant marker (Glutathione) and increase in the level of lipid peroxidation (TBARs) and increase in nitrite levels was found to be the reason of depression and catalepsy and it majorily decreased the levels of TBARs and nitrites whereas increase the level of GSH revealed the antioxidant nature of the extract and also an indication of effective herbal antidepressant [14].	2. Its extract significantly countered altered blood glucose and corticosterone levels in animals exposed to acute restraint stress [18].	2. Its active principle ursolic acid known increase the level of noradrenaline, 5HT and dopamine level in the brain. Hence, the antide- pressant like activity of tulsi might be due its modulatory effect on central monoamines [23, 26].
	3. It may be showing its anxiolytic effect by blocking calcium channel like nifedepine. The ability of calcium channel blockers (nifedipine) to displace the binding of benzodiazepine ligands was investigated in rat heart, kidney, and brain [15].	3. Aqueous extract of *E. officinalis* showed antidepressant like activity possibly by inhibiting Monoamine oxidase A (MAOA) and Gamma Amino Butyric Acid (GABA), along with its antioxidant activity [19].	
Uses	Antianxiety& antioxidant	Antidepressant & antioxidant	Antistress & antidepressant

Thiobarbituric acid reactive substances (*TBARS*)

Materials and Methods

Collection and Authentication of Plant Material

The fruit of *Foeniculum vulgare, Emblica officinalis* and aerial part of *Ocimum sanctum* were obtained from Haridwar city and authenticated by Department of Botany, IFTM University, Moradabad, UP. A voucher specimen was preserved in the Department of Pharmacy, IFTM University for future reference.

Preparation of Extracts

The plants were washed with distilled water to remove dirt and soil and shade dried in a ventilated place at room temperature. Each dried plant materials were reduced to coarse powder by mechanical grinder separately, extracted with methanol:water (70:30) and water as solvent in soxhlet extractor for 18 hours. The hydroalcoholic and aqueous extract of fruit of *Foeniculum vulgare, Emblica officinalis* and aerial part of *Ocimum sanctum* were filtered and concentrated under reduce pressure using rotavapor (Buchi, USA), then freeze-dried (Freezone® 4.5, Labconco, USA) and stored in deep freezer for further use. Solution of each extract was prepared freshly for all standardization parameters.

Physicochemical Parameters

Physicochemical parameters like foreign matter, moisture content (loss on drying), total ash, water-soluble ash, acid-insoluble ash, sulphated-ash, alcohol-soluble extractive, water-soluble extractive and pH values were determined as mentioned in Ayurvedic Pharmacopoeia [27].

Preliminary Phytochemical Screening

Phytochemical screening was carried out for the aqueous and hydroalcoholic extracts of fennel, amla and tulsi for the presence or absence of various phytoconstituents [28].

Results

Table 2: Physicochemical parameters for the aqueous and hydroalcoholic extract of fruit of fennel and amla and aerial part of tulsi

S.no.	Analytical parameters	Fennel (%w/w)			Amla (%w/w)			Tulsi (%w/w)		
	Fractions	Rm	Aq.	Alc.	Rm	Aq.	Alc.	Rm	Aq.	Alc.
1.	Foreign matter	1.7	-	-	1.9	-	-	1.5	-	-
2.	Moisture content (loss on drying)	7.88	3.45	3.67	7.66	3.67	3.01	10.09	3.69	3.72
3.	Total ash	4.56	5.98	4.66	2.32	3.92	2.59	9.46	9.29	9.76
4.	Acid-insoluble ash	1.22	0.78	0.85	1.66	0.48	0.94	2.69	0.89	0.99
5.	Water -soluble ash	0.46	0.73	0.81	0.98	0.64	0.92	4.62	0.90	1.21
6.	Sulphated ash	3.66	3.12	3.25	2.23	2.86	2.46	7.23	9.01	9.52
7.	Alcoholic soluble extractive value (70:30)	10.05	53.56	67.88	41.16	49.91	66.55	8.00	31.78	46.49
8.	Water soluble extractive value	7.98	78.31	84.34	54.70	33.65	58.04	14.24	84.62	79.39
9.	pH	-	5.21	5.38	-	3.43	3.86	-	4.97	5.13

Rm = Raw material, Aq. = Aqueous extract, Alc. = Hydroalcoholic extract

Table 3: Preliminary phytochemical screening for the aqueous and hydroalcoholic extract of fruit of fennel and amla and aerial part of tulsi

S.No.	Phytochemical screening	Fennel		Amla		Tulsi	
	Extract	Aq.	Alc.	Aq.	Alc.	Aq.	Alc.
1.	Carbohydrates	+ve	+ve	+ve	+ve	-ve	-ve
2.	Amino Acids	-ve	-ve	+ve	+ve	-ve	-ve

3.	Quinone	-ve	-ve	+ve	+ve	-ve	-ve
4.	Steroid	-ve	+ve	-ve	+ve	+ve	+ve
5.	Fats and Oil	-ve	+ve	-ve	-ve	-ve	+ve
6.	Alkaloid	-ve	+ve	-ve	-ve	+ve	+ve
7.	Tannin and Phenoilc compound	+ve	+ve	+ve	+ve	+ve	+ve
8.	Saponin Glycoside	+ve	-ve	-ve	-ve	+ve	+ve
9.	Flavonoid	+ve	+ve	+ve	+ve	+ve	+ve
10.	Triterpene	+ve	+ve	-ve	+ve	-ve	+ve
11.	Volatile oil	+ve	+ve	+ve	+ve	+ve	+ve

+ve = Present, -ve = Absent, Aq. = Aqueous, Alc. = Hydroalcoholic

Discussion and Conclusion

Herbal plants used for neuropharmacological studies are as yet under investigation. Herbal medications can possibly treat different kinds of body diseases. The present work deals with the investigation of their biological name, common name, mechanism of action and uses which may helpful for researchers to develop new neuropharmacological polyherbal formulations. It has also evaluated the physicochemical parameters that can be helpful to lay down the standard for the authenticity of these herbal plants. Standardization of drugs means confirmation of its identity and determination of its quality and purity. Physicochemical parameter such as loss of drying, ash value, acid soluble ash and water and alcohol soluble extractive values, pH values were carried out to evaluate the quality and standard for the authenticity of these herbal plants showed in table 2. Preliminary phytochemical screening of aqueous and hydroalcoholic extracts of herbal plants were carried out to reveal the presence of different primary and secondary metabolites in their aqueous and hydroalcoholic extract (table 3) which showed the presence of flavonoids, carbohydrates, saponins, proteins, tannins, glycosides, phenol and alkaloids. Today, there has been developing interest in the therapeutic utilization of herbal plants because of their safety, economical and effective use. Based on literature review and after studying the above description of following herbal plants, we have planned to choose only few plants to design a new polyherbal formulation to treat neuropharmacological disorder. In spite of the fact that evidence of effectiveness of herbs and their preparations in treating neuropsychiatric disorder in the worldwide market. The effectiveness of these herbal plants is slowed down by the limited knowledge regarding chemical composition of the products, lack of standardization of these preparations and facility of well controlled studies.

Conflict of interest

The authors declared no conflict of interest.

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