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FORMULATION OF NATURAL ANTI-STRESS POWDER AND EVALUATION OF ITS NUTRITIONAL CONTENT

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ABSTRACT

There is currently much interest in phytochemicals as bioactive molecules of food. Functional foods are an emerging field in food science due to their increasing popularity among health conscious consumers. The aim of this work was to evaluate the nutrients and anti-stress compounds of two mixtures based on Flax seed and Karunguruvai rice. The results of the present study concluded that the formulation of anti-stress powder from Flax seed and Karunguruvai rice contain rich source of phytochemicals, proximate composition, vitamins and minerals.

Keywords: Phytochemicals, Proximate composition, Elements, Vitamins, Karunguruvai rice and Flax seed

INTRODUCTION

Foods rich in dietary fiber and antioxidants can satisfy some of the demands for health benefits. Intake of dietary fiber and antioxidants has been related to the maintenance of health and/or reduction of the incidence of certain diseases. Flax seed is an annual herbaceous plant with shallow root system. The common names flax and linseed are used in North America and Asia, respectively. Oilseed varieties and fiber varieties are specialized development of this species (Millam, *et al.*, 2005). This suggests that flax may have been initially selected as an oilseed crop (Allaby *et al.*, 2005). Phenolic compounds in general possess an aromatic ring bearing one or more hydroxyl substituents and may be found in free state, conjugated with sugars or esters or polymerized (Shahidi, 2000). In plants, phenols play an important role in protection against photo-oxidation and disease resistance (Antolovich *et al.*, 2000) Phenolic compounds in general possess an aromatic ring bearing one or more hydroxyl substituents and may be found in free state, conjugated with sugars or esters or polymerized (Shahidi, 2000). Among these, phenolic acids and flavonoids are more common (De beer *et al.*, 2002; Dykes and Rooney, 2007). In addition to protective effect, phenolics are responsible for color, taste, organoleptic properties of the plant origin foods (Yáñez *et al.*, 2004). Genetics, cooking quality, and other antioxidant properties are necessary for germplasm conservation (Sinha and Mishra, 2013). Physiochemical properties govern the eating and cooking qualities of rice which include properties like amylose content, gel consistency and gelatinization temperature (Rohilla, 2000). The aim of the study to evaluate the nutrients and anti-stress powder of two mixtures based on Flax seed and Karunguruvai rice.

MATERIALS AND METHODS

Collection of samples

The Flax seed and Karunguruvai rice were purchased in May 2024 from Traditional

Medicine Shops in Thanjavur, Thanjavur district, Tamil Nadu, India. The health Flax seed and Karunguruvai were make a fine powder and used for analysis.

Qualitative Preliminary phytochemical analysis

Preliminary phytochemical screening was carried out by using standard procedure followed by Sofowara (1993), Trease and Evans (1989) and Harborne (1973, 1984).

Qualitative analysis of Inorganic elements

Sample (2gm) was prepared and treated with HNO_3 and HCl (3:1 v/v) for 1 hour. After the filtration, the filtrate was used to perform the following tests (Khandelwal 2006).

Qualitative Analysis of Vitamins

Qualitative analysis of vitamin, (Pearson, 1976; Patel, 2005).

Proximate analysis

Determination of moisture content (Loss on drying). Crude fiber content was determined by following the method of Sadasivam and Manikam (1992). Dry Ashing estimated by the method of Ranganna (1986). Protein estimated by the method of Sadasivam and Manikam (1997). Total fat content of sample determines by the method of Ranganna (1986). Calculation of the total crude carbohydrate content of the sample was done using the formula (Janardhanan and Lakshmanan, 1985). The energy value of the samples was determined by multiplying the protein content by 4, carbohydrate content by 4 and fat content by 9 (AOAC, 1990).

Functional properties analysis

The bulk density (BD) was determined according to method of Momoh *et al.,* (2012), The water absorption index determine by the method of Suraiya Jamal *et al.,* (2016). The water solubility index of starches was carried out as described by Anderson and Sefa-dedeh (2001). The method of Okaka and Potter (1977) with some modifications were used for determining the swelling capacity.

Anti-stress activity (Tanuj Joshi1 *et al*., 2012)

Malondialdehyde was estimated by the thiobarbituric acid assay method of Beuge and Aust (1978). Superoxide dismutase activity was determined by the procedure of Kakkar *et al.* (1984), The activity of catalase was assayed by the method of Beers and Sizer (1952).

RESULTS AND DISCUSSION

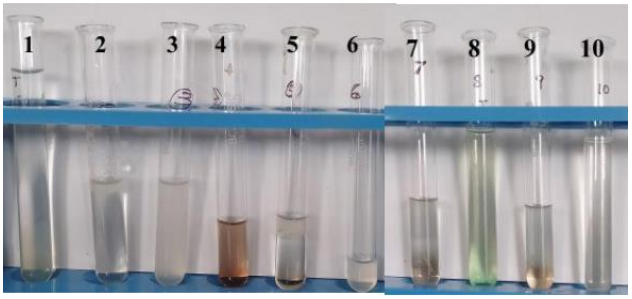
Present study was carried out to screen qualitative analysis of phytochemicals in the Flax seed and Karunguruvai rice extract. Table 1 represent the qualitative analysis of phytochemicals in Flax seed and Karunguruvai rice extract. The phytochemical screening anti-stress powder showed that the presence of tannin, saponins, flavonoids, terpenoids, alkaloids, steroids, antroquinones, polyphenol, glycosides and coumarins in aqueous extract.

Terpenoids were well known for antibacterial, anti-inflammatory and anticancer properties (Chung *et al.,* 1998). Alkaloids were known to be possessing analgesic as well as antibacterial properties (Nassar *et al.,* 2010). Phenolic compounds and phytosterol present in plants are responsible for antimicrobial, antiallergic, antidiabetic, antioxidant, anti-inflammatory, antimutagenic and anticarcinogenic properties (Khan *et al.,* 2015). Compounds belonging to the respective groups have been reported to impart various medicinal characteristics to the plants. The presence of saponins in plant is very important because of their anticancer, antifungal, antioxidant, antibacterial activity (Lira *et al.,* 2017). Glycosides play role in the anticoagulant activity and antitumor activity (Xiao, 2017).

Table 1: Qualitative analysis of Phytochemicals in Flax seed and Karunguruvai rice extract

S. No	Phytochemicals	Aqueous
1	Tannin	+
2	Saponin	++
3	Flavonoids	+
4	Steroids	+
5	Terpenoids	+
6	Alkaloids	+
7	Antroquinone	+
8	Polyphenol	++
9	Glycoside	++
10	Coumarins	+

(+) Present, (++) High concentrations and (–) Absent



(1.Tannin, 2. Saponin, 3. Flavonoids, 4. Steroids, 5. Terpenoids, 6. Alkaloids, 7. Anthroquinone, 8. Polyphenol, 9. Glycoside and 10. Coumarins)

Plate 1: Qualitative analysis of Phytochemicals Flax seed and Karunguruvai rice extract

Anthraquinones present in plants are responsible for the regulation of immunity and play therapeutic role in autoimmune diabetes (Rastogi *et al.,* 2015). Anthocyanin possess anticancer and neuroprotective properties (Chien *et al.,* 2015).

Vitamins

The present study was performed to evaluate the vitamin analysis in Flax seed and Karunguruvai rice. The highest concentration of Vitamin C and E. Table 2 represent the vitamin analysis of Flax seed and Karunguruvai rice extract.

Table 2: Qualitative analysis of vitamins in Flax seed and Karunguruvai rice extract

Vitamins	Results
Vitamin A	-
Vitamin C	++
Vitamin D	-
Vitamin E	++

(+) Presence, (++) and High concentration

(Vitamin A, Vitamin C, Vitamin D, Vitamin E)

Plate 2: Qualitative analysis of vitamin in *Flax seed* and *Karunguruvai* rice extract

There are many other food components which have vitamin activity but these are not true vitamins. There are wide range of dietary sources including both plant and animal sources for these vitamins. Vitamins are groups of highly complex compounds, organic in nature, present in foodstuffs in traces, essential for normal metabolism and absence of these nutrients cause disorders whereas, resupply of these nutrients can cure the deficiency symptoms (Marshall, 1986). Vitamins are diverse in nature relative to fats, carbohydrates and proteins. Vitamins are differentiated from other groups by their organic nature and their classification depends on chemical nature and function. Very trace amounts of vitamins are needed for growth, development, health and reproduction. Some vitamins are deviants from usual definition and not always needed to be part of food stuff i.e. ascorbic acid, vitamin D and niacin. Therefore, specific species and under certain conditions vitamin D, ascorbic acid and niacin does not fit in the definition of vitamins (McDowell, 2000).

Elemental analysis

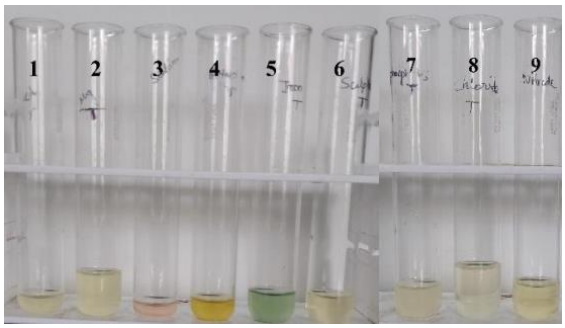
Minerals are inorganic substances required by the body in limited quantities for an

assortment of functions. These incorporate the arrangement of bones and teeth; as basic constituents of body liquids and tissues; as parts of chemical frameworks and for ordinary nerve function (Asagba, 2010). A few minerals are required in bigger amounts than others, for example, calcium, phosphorus, magnesium, sodium, potassium and chloride. Others are required in littler amounts and are now and again called trace minerals, for example, iron, zinc, iodine, fluoride, selenium and copper. In spite of being required in littler amounts, trace minerals are no less significant than different minerals. The basic functions performed by the minerals are: they are structural components of body tissues, are involved in the maintenance of acid-base balance and in the regulation of body fluids, in transport of gases and in muscle contractions (Soetan *et al.,* 2010). In the present study to investigate the elements analysis in plant and noticed in table 3. Flax seed and Karunguruvai rice extract contain calcium, Phosphate, magnesium, potassium, iron, nitrate, sodium, sulphate and chloride.

Table 3: Qualitative analysis of vitamins in Flax seed and Karunguruvai rice extract

S. No	Inorganic elements	Flax seed and Karunguruvai rice extract
1	Calcium	++
2	Magnesium	++
3	Sodium	++
4	Potassium	++
5	Iron	++
6	Sulphate	++
7	Phosphate	++
8	Chloride	++
9	Nitrate	+

+: Present ,-: Absent



(Calcium, Magnesium, Sodium, Potassium, Iron, Sulphate, Phosphate, Chloride, Nitrate)

Plate 3: Qualitative analysis of elements in Flax seed and Karunguruvai rice extract

Elemental analysis is the qualitative detection and quantitative determination of chemical elements (atoms, ions) in a sample. To detect an element, one should fix an appearance of an analytical signal: the formation of precipitate or characteristic crystals, color change, an isolation of gaseous products, an appearance of a definite lines in spectrum, luminescence, etc. (Oliver *et al.,* 2021). The various elements exhibit essential roles in biochemical processes in human bodies, whose distribution and quantification in biological fluids, tissues, and organs as diagnosed biomarkers have been progressively significant pieces of information in life sciences and medicine. Minerals have a unique ability to interact with viruses, microbes and macro-biomolecules through multipoint ionic and/or non-covalent contacts, with potential for novel applications in therapy (Brooks *et al.,* 2020).

Proximate Analysis

Carbohydrates, proteins, and fats are the main types of macronutrients in food (nutrients that are required daily in large quantities). They supply 90% of the dry weight of the diet and 100% of its energy. Proteins consist of units called amino acids, strung together in complex formations. Because proteins are complex molecules, the body takes longer to break them down. As a result, they are a much slower and longer-lasting source of

energy than carbohydrates. Fats are complex molecules composed of fatty acids and glycerol. The body needs fats for growth and energy. It also uses them to synthesize hormones and many other substances needed for the body's activities (such as prostaglandins). This indicates the rich source of nutrient present inhealth mix. The results were not different from that obtained from literatures (Weiss, 2000; Potter and Hotchkiss, 2006). The chemical composition of the composite flours has been shown to affect both physico-chemical properties and nutritional quality of their products (Dhingra and Jood, 2001; Akhtar *et al.*, 2008; Mashayekh *et al.*, 2008). Table 4 represent the proximate composition analysis in Flax seed and Karunguruvai rice. The moisture, Total ash, fiber, protein, lipid, carbohydrate and Amino acid content of anti-stress mix was 9%, 4%, 4%, 239%, 0%, 4.88% and 0.968%.

Table 4: Proximate composition analysis in Flax seed and Karunguruvai rice mix

S. No	Analysis	Flax seed and Karunguruvai rice mix
1	Moisture content (%)	9.00
2	Total Ash (%)	4
3	Fiber (%)	4
4	Protein (mg/g)	239
5	Lipid(gm)	0
6	Carbohydrates (mg/g)	4.88
7	Amino acid(mg/g)	0.968

Functional properties and Organoleptic test

The particle size was determined by sieving method and the maximum amount of weight retention of the sample. Various functional properties of Flax seed and Karunguruvai rice mix as particle size, particle density, bulk density swelling capacity, and water absorption capacity were determined and are presented in table 5. The responses for organoleptic evaluation of Flax seed and Karunguruvai rice mix are given in Table 6. The comparative study for organoleptic parameters such as color, taste, odour, texture which confirm the overall acceptability. Water absorption capacity of health mix flour of showed in Table 5. The present findings revealed that Absorption Capacity of flour was 0.29%Water absorption is the ability of flour to associate with water under specific conditions where water is limited (Adebayo et al., 2013; Jamal et al., 2016). Water solubility index of health mix flour represent in Table 5. The present findings revealed that solubility of health mix flour was 12%. The WSI of flour depends on the temperature and amylose content of rice flour. However, relationship of solubility with temperature was directly related, while amylose content has inverse relation to solubility of rice flour (Wadchararat *et al.*, 2006). The present findings revealed that Swelling Power of health mix flour was 1.20%. The SC of health mix flour might be affected by amylose and protein content, which inhibit the granular swelling due to disulphide and intermolecular bonding in protein that result in extensive and strong network (Fari *et al.*, 2014).

Table 5: Functional properties analysis in Flax seed and Karunguruvai rice mix

S. No	Analysis	Flax seed and Karunguruvai rice mix
1	Bulk density (g/ml)	0.6
2	Water solubility (%)	0.01
3	Water adsorption (g/g)	0.22
4	Swelling capacity (g/ml)	1.7

Table 6: Organoleptic test in Flax seed and Karunguruvai rice powder

S.no	Analysis	Result
1.	State	Powder
2.	Colour	Roseuvad or peanut brown
3.	Texture	Semi solid
4.	Taste	Sourness
5.	odour	Sour Smell

Anti-stress

Anti-stress effect of Flax seed and Karunguruvai rice extract on MDA, SOD and CAT activity in experimental group in RBC represent in table 6. The oxidative stress markers as MDA increased while SOD and CAT decreased in negative control compared to control group. On treatment with on Flax seed and Karunguruvai rice extract decreased stress markers MDA while SOD and CAT activity were increased. This indicates the anti-stress activity of Flax seed and Karunguruvai rice extract

Table 7: Anti-stress effect of Flax seed and Karunguruvai rice extract on MDA, SOD and CAT activity in experimental group in RBC

Parameters	Group I (Control)	Group II (Negative)	Group III (100µg/ml)	Group IV (200µg/ml)	Group V (400µg/ml)
MDA	3.612±0.25	6.255±0.43	4.537±0.31	4.229±0.29	3.788±0.26
SOD	0.742±0.05	0.296±0.20	0.439±0.03	0.542±0.03	0.704±0.04
CAT	5.274±0.36	2.530±0.17	2.835±0.19	3.616±0.25	5.138±0.35

Value were expressed as Mean ± SD for triplicate

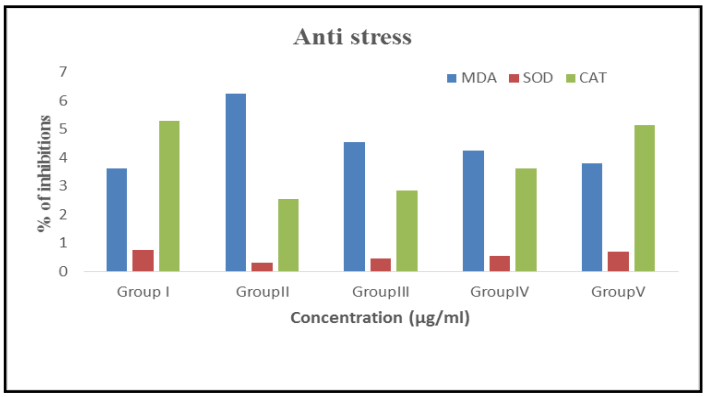


Figure 1: Anti-stress effect of Flax seed and Karunguruvai rice extract on MDA, SOD and CAT activity in experimental group in RBC

In the present study, the potential of anti-stress been explored on RS-induced changes in different parameters. Oxidative stress is considered to have a critical role in changes associated with stress and it is conceivable that antioxidants are important antistress agents (Lyle *et al.*, 2009). The intensity of oxidative stress is determined not only by the free radicals production but also by antioxidant enzymatic and non-enzymatic) defense (Beltowski *et al.*, 2000). The enzymatic antioxidant and non-enzymatic antioxidants, which play an important role in the protection of cells against free radical mediated damage. During stress, antioxidant functions decline in almost all mammals. Also, higher levels of free radicals have been reported in stress (Halliwell and Gutteridge, 2015).

CONCLUSION

Food is a primary want of humans that offers nutrients for growth and health. The concept of food as medicine emphasizes that nutrition has been an integral component in many typical forms of medicine. The results of the present study concluded that the formulation of anti-stress mix powder from Karunguruvai rice and Flax seed contain rich source of phytochemicals, proximate composition, vitamins and minerals.

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