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## World Journal of Science and Research



### Article

### Biotechnology

#### PREPARATION OF NUTRIENT ENRICHED POWDER AND ANALYSIS OF ITS NUTRITIONAL CONTENT FROM KATTUYANAM RICE AND PAASIPARUPPU

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Received on 20<sup>th</sup> May. 2024;

Revised on 30<sup>th</sup> May. 2024

Online 13<sup>th</sup> June. 2024

#### ABSTRACT

All living organisms require food. Plants can synthesise food for themselves but animals including humans cannot. They get it from plants or animals that eat plants. Thus, humans and animals are directly or indirectly dependent on plants. The nutrients enable living organisms to build their bodies, to grow, to repair damaged parts of their bodies and provide the energy to carry out life processes. Nutrition is the mode of taking food by an organism and its utilisation by the body. The aim of the study to screen the nutritional content of formulation of health mix from *Kattuyanam* rice and *Paasiparuppu*. The results of the present study concluded that the formulation of health mix from *Kattuyanam* rice and *Paasiparuppu* contain rich source of phytochemicals, proximate composition, vitamins and minerals.

**Keywords:** Phytochemicals, Proximate composition, Elements, Vitamins, *Kattuyanam rice* and *Paasiparuppu*

#### INTRODUCTION

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. Chronic illnesses are directly associated with an unhealthy lifestyle, leading to obesity, diabetes, cardiovascular disease and its comorbidities; shreds of proof suggesting that acceptable nutrition can reduce the sickness burden. Upon consumption of wholesome food, people get a sense of wellbeing and it is also considered a cornerstone in the prevention of continual illnesses. Consumers are gaining

attention to the significance of eating healthy, healthy foods. Baked merchandise is in many instances' cereal-based and is considered one of the most inexpensive sources of hunger pride. Our ancestors named the traditional varieties based on the plant height, mode of tillering, period of flowering, grain shape, color and size, and its unique properties. One such valuable rice variety is *Kattuyanam* which has procured its name due to its profound height that can even hide a wild elephant( Kennedy *et al* ,2002, . Sulochana *et al*,2015 also recognized as *Kattuyanam* rice is one of the cereal crops historically cultivated in India. *Kattuyanam* rice can be distinguished from its counterparts by its

notable nutrient potential and anti-oxidant properties. Green gram or mung bean (*Vigna radiata* [L.] Wilczek) is an important food legume grown under tropical and subtropical conditions. It is an excellent source of protein and is almost free from flatulence-causing factors. Because of this, green gram seeds are preferred for feeding babies and those convalescing. Green gram (Paasiparuppu) possesses antiinflammatory, anti-oxidant and

#### **Preparation of Nutritional enhanced powder**

The *Kattuyanam rice* and *Paasiparuppu L* were purchased in May 2024 from Traditional Medicine Shops in Thanjavur, Tamil Nadu, India. The health *Kattuyanam rice* and *Paasiparuppu L*, were made a fine powder and used for analysis.

#### **Qualitative Preliminary phytochemical analysis**

##### **Preparation of extracts**

Aqueous extract of *Kattuyanam rice* and *Paasiparuppu L*, Take one gram of plant powder in the extract prepared in 50 ml of aqueous, the extract shake it well for 30 minutes by free hand and wait for 24 hours. After extracts were filtered using whatman filter paper No.1 and filtrate used for further 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<sub>3</sub> 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

anti-diabetic properties. Green gram or mung bean (*Vigna radiata* L.) is the third most important food legumes grown and consumed in India and is a good source of proteins and minerals and its protein quality is similar to or better than other legumes (Kataria et al., 1989). The aim of the study to screen the nutritional content of formulation of health mix from *Kattuyanam rice* and *Paasiparuppu*.

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-dede (2001). The method of Okaka and Potter (1977) with some modifications were used for determining the swelling capacity.

##### **Total antioxidant capacity**

The antioxidant capacity of sample was evaluated by the phosphomolybdenum method according to the procedure of Prieto *et al.*, (1999).

## **RESULTS**

### **Phytochemicals qualitative analysis in health mix**

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). 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). Glycosides play role in the anticoagulant activity and antitumor activity (Xiao, 2017).

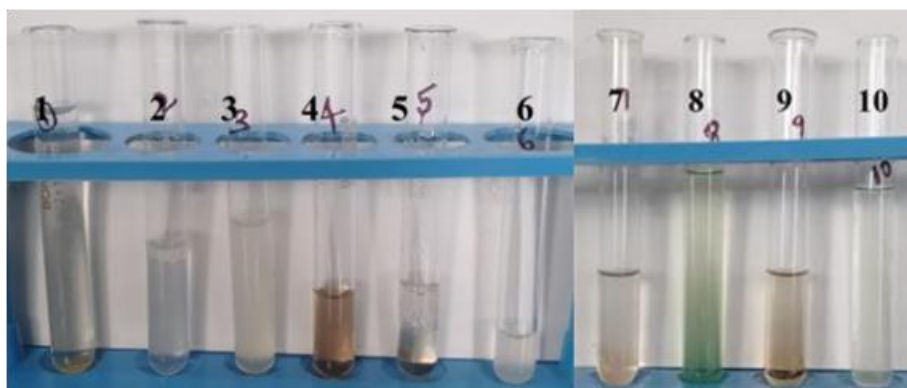
Anthocyanin possess anticancer and neuroprotective properties (Chien *et al.*, 2015). Anthraquinones present in plants are responsible for the regulation of immunity and play therapeutic role in autoimmune diabetes (Rastogi *et al.*, 2015). In the present study was carried out on the health mix revealed the presence of medicinally active constituents. The

phytochemical characters of the health mix investigated and summarized Table 1 and Table 2. The phytochemical screening health mix showed that the presence of saponins, terpenoids, alkaloids, antroquinones, polyphenol, glycosides and coumarins , tannin, flavonoids and steroids in aqueous extract.

**Table 1: Qualitative analysis of Phytochemicals kattuyanam rice, vigna radiata L 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	+

(+) Presence, (++) High concentrations and (-) Absences



**Aqueous extract**

**(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 kattuyanam rice, Paasiparuppu L extract**

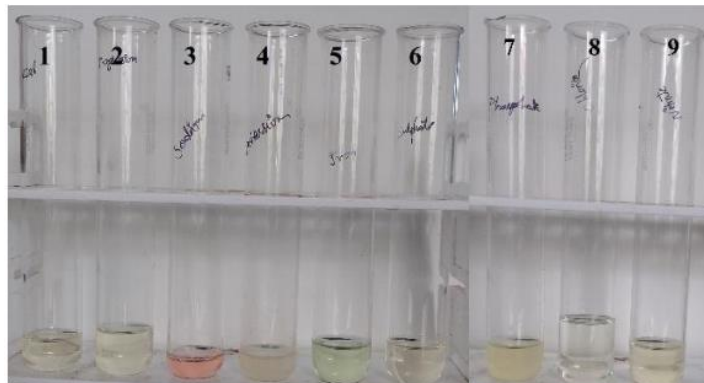
In the present study to investigate the elements analysis in nutrient enhance product. *kattuyanam rice*, *vigna radiata L* extract contain calcium, Phosphate, magnesium, potassium, iron, nitrate while sodium, and sulphate while chloride were absent. The *kattuyanam rice*, *vigna radiata L* extract calcium, magnesium, sodium, sulphate, potassium, phosphate, iron,

and nitrate while chloride was absent (Table 2 and Plate 2). A considerable amount of micronutrients, such as calcium, iron, magnesium, and phosphorus, were identified in fish scales reported by Begum *et al.*, (2021). Calcium and magnesium had a significant contribution to bone and muscle health.

**Table 2: Qualitative analysis of elements in Kattuyanam rice, Vigna radiata L extract**

S. No	Inorganic elements	Kattuyanam rice, Vigna radiata L 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. 2: Qualitative inorganic elemental analysis in kattuyanam rice, vigna radiata L extract**

### Vitamins

There are wide range of dietary sources including both plant and animal sources for these vitamins. Vitamins are direly important for human health, growth, development, reproduction and maintenance, and their deficiencies are imposing serious health hazards. Thirteen vitamins are true vitamins which are further classified as water soluble and fat soluble vitamins. Vitamin A, E, K and D are fat soluble vitamins whereas, vitamin B1, B2, B3, B5, B6,

B9, B12, biotic and vitamin C are water soluble vitamins. (McDowell,2000).

There are wide range of dietary sources including both plant and animal sources for these vitamins. Their regular dietary intake is essential for proper maintenance of health and development. Vitamin deficiencies are causing the serious health problems, impairment of normal growth and development. Basic

introduction of vitamins, their biological importance. The present study showed the presence of Vitamin C and Vitamin E while

Vitamin A and Vitamin D were absent in *kattuyanam* rice, *vigna radiata* extract.(Table 3 and Plate 3).

**Table 3: Qualitative analysis of vitamins in Enriched nutrient extract**

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

+) Presence, (++) and High concentration



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

**Plate. 3: Qualitative analysis of vitamins in kattuyanam rice, vigna radiata L extract**

**Proximate Analysis of health mix**

Proximate composition of the Instant health mix was analysed according to the AOAC (1980) method. The present study was analysed the proximate composition and represent in table1. The moisture, Total ash, fiber, protein, lipid, carbohydrate and Amino acid content of health mix was 14%, 0%,4%,171%,120%,4%, and 0.30%, (Table 4).

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: Proximate composition analysis in health mix**

S. No	Analysis	Health mix
1	Moisture content (%)	14.00
2	Total Ash (%)	0
3	Fiber (%)	4
4	Protein (mg/g)	171
5	Lipid (gm)	120
6	Carbohydrates (mg/g)	4
7	Amino acid (mg/g)	0.30

**Water Absorption Capacity (WAI)**

Water absorption capacity of health mix flour of showed in Table 3. 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). The composition of flour such as carbohydrate, fiber, protein and amylose content are the major factors influencing water absorption index. Particle size of flour is another important factor which effect water absorption capacity. Flour with smaller particle size has higher surface area for flour hydration (Chaiwanichsiri et al., 2012). The WAI is also dependent upon pore size, capillary and protein charges. This is due to strong correlation of extent of protein hydration with polar constituents along with the interaction of hydrophilic components by hydrogen bonding. The higher protein content lead to strong hydrogen bond, which subsequently increase the water absorption capacity of rice flour. The difference in variety and starch granule structure significantly influence the hydration capacity of the flour (Adeyeye and Aye, 1998). (Table 5)

**Water Solubility Index (WSI)**

Water solubility index of health mix flour represent in Table 3. 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). Other factors which affected water solubility are the presence of protein and starch lipids complex, which reduces solubility (Chaiwanichsiri et al., 2012). One of the major factors effecting water solubility is the methods of milling and damaged starch content (Heo et al., 2013). The degradation of starch granules led to higher water solubility.

**Swelling capacity (SC)**

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; Likitwattanasade, 2009) Protein is one of the most important macronutrient, which has the ability to bind starch and form starch granules, which affect the pasting properties of rice flour. The protein and starch content in rice flour are embedded tightly in the lipid matrix and form an amylose lipid complex that influences the pasting properties (Rosniyana and Hazila, 2013). Similarly, the ratio of amylopectin and amylose as well as their structural confirmation in a starch granule substantially effect flour swelling power (Tester and Debon, 2000).

**Table 5: Functional properties analysis in health mix**

S. No	Analysis	Health mix
1	Bulk density (g/ml)	0.7
2	Water solubility (%)	1.706
3	Water adsorption (g/g)	0.54
4	Swelling capacity (g/ml)	1.9

**Table 6: Proximate composition analysis in Kattuyanam Rice and *vigna radiata L* extract**

S. No	Analysis	Kattuyanam Rice	<i>Vigna radiata L</i>
1	Fiber (%)	13.5	5
2	Protein (mg/g)	133	67.4
3	Lipid(gm)	0.07	0.19
4	Carbohydrates (mg/g)	3.05	2.25
5	Amino acid(mg/g)	0.08	0.21

**Total antioxidant capacity (TAC) of health mix**

The results indicate higher TAC of the health mix. It was, however, observed that the extract

possesses significant total antioxidant capacity of health mix was equivalent to 841.71µg/g, 113.142 µg/g, 1598.857 µg/g of ascorbic acid per gram of dry weight.

**Table 7: Organoleptic test in Kattuyanam rice and *Vigna radiata L***

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

**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 health mix from *Kattuyanam rice* and *Paasiparuppu* contain rich source of phytochemicals, proximate composition, vitamins and minerals

**References**

- Adebayo, O. R., Olayiwola, O. A., & Shittu, S. A. (2013). Functional properties and anti-nutritional factors of some selected Nigerian cereals. *Comp. Res. J Agric. Sci*, 1(1), 1-5.
- Adeyeye, E. I., & Aye, P. A. (1998). The effects of sample preparation on the proximate composition and the functional properties of the African yam bean. *Stud.* (2021) 9:26–31
- Boye, J.; Zare, F.; Pletch, A. Pulse proteins: Processing, characterization, functional properties and applications in food and

(*Sphenostylis stenocarpa* Hochst ex A. Rich) flours. Note 1. *Rivista Italiana delle Sostanze Grasse*, 75(5), 253-261.

- Akhtar, S., Anjum, F., Rehman, S., Sheikh, M., & Farzana, K. (2008). Effect of fortification on the physico-chemical and microbiological stability of whole wheat flour. *Food Chem.*, 112, 156-163.
- Anderson, E. O., & Sefa-Dedeh, S. (2001). Chemical composition and quality changes occurring in *Dioscorrea dumentorum* pax tubers after harvest. *Food Chem*, 75, 85-91.
- AOAC. (1990). Official Methods of Analysis of the Association of Official Analytical Chemists, Vol. II, 15th ed. Sec.985.29. The Association: Arlington, VA.
- Begum M, Mun MZUAM, Satter MA. Nutritional profiling of selected fish's scales: An approach to determine its prospective use as a biomaterial. *Int J Fish Aquat*
- feed. *Food Res. Int.* 2010, 43, 414–431. [CrossRef]
- Chaiwanichsiri, S., Thumrongchote, D., Suzuki, T., & Laohasongkram, K. (2012). Properties of non-glutinous Thai rice flour:



- effect of rice variety. *Research Journal of Pharmaceutical, Biological and Chemical Sciences*, 3(1), 150-164.
- Chen, Y., Wang, Z., Zhang, H., Liu, Y., Zhang, S., Meng, Q., & Liu, W. (2018). Isolation of high purity anthocyanin monomers from red cabbage with recycling preparative liquid chromatography and their photostability. *Molecules*, 23(5), 991.
- Chung, K. T., Wong, T. Y., Wei, C. I., Huang, Y. W., & Lin, Y. (1998). Tannins and human health: a review. *Critical reviews in food science and nutrition*, 38(6), 421-464.
- Dahiya, P.K.; Linnemann, A.R.; Van Boekel, M.A.J.S.; Khetarpaul, N.; Grewal, R.B.; Nout, M.J.R. Mung bean: Technological and nutritional potential. *Crit. Rev. Food Sci. Nutr.* 2015, 55, 670–688. [CrossRef] [PubMed]
- Fari, M. J. M., Rajapaksa, D., & Ranaweera, K. K. D. S. (2011). Quality characteristics of noodles made from selected varieties of Sri Lankan rice with different physicochemical characteristics. *Journal of the National Science Foundation of Sri Lanka*, 39(1).
- Kennedy G. *et al.* Nutritional contribution of rice and impact of biotechnology and biodiversity in rice-consuming countries *Food Agric. Organ Unit. Nation.* (2002)
- Gan, R.-Y.; Lui, W.-Y.; Wu, K.; Chan, C.-L.; Dai, S.-H.; Sui, Z.-Q.; Corke, H. Bioactive compounds and bioactivities of germinated edible seeds and sprouts: An updated review. *Trends Food Sci. Technol.* 2017, 59, 1–14. [CrossRef]
- Harborne J.B. (1973). *Phytochemical Methods; A guide to modern techniques of plant Analysis.* 2nd Edition, London New York.
- Harborne J.B. (1984). *Phytochemical Methods; A guide to modern techniques of plant Analysis.* 2nd Edition, London New York.
- Hussain, T.; Tontisirin, K.; Chaowanakarnkit, L. Protein digestibility of weaning foods prepared from rice-minced meat and rice-mungbean combination in infants using a short term nitrogen balance method. *J. Nutr. Sci. Vitaminol.* 1983, 29, 497–508. [CrossRef] [PubMed] *Nutrients* 2019, 11, 1238–1252
- Jamal, S., Qazi, I. M., & Ahmed, I. (2016). Comparative studies on flour proximate compositions and functional properties of selected Pakistani rice varieties: Comparative studies on flour proximate compositions and functional properties. *Proceedings of the Pakistan Academy of Sciences: B. Life and Environmental Sciences*, 53(1), 47-56.
- Janardhanan, K., & Lakshmanan, K. K. (1985). Studies on the pulse *Mucuna utilis*: chemical composition and antinutritional factors. *J. Food Sci. Technol.* 22: 369 – 371.
- Kannaiyan, S., (1999). *Bioresource technology for sustainable agriculture.* Associated Publishing Company. New Delhi, pp: 422.
- Kataria, A., Chauhan, B.M. and Punia, D. (1989). Anti-nutrients and protein digestibility (in vitro) of mung bean as affected by domestic processing and cooking. *Food Chem.*, 32:9-17.
- Khan, M. K., Karnpanit, W., Nasar- Abbas, S. M., Huma, Z. E., & Jayasena, V. (2015). Phytochemical composition and bioactivities of lupin: a review. *International journal of food science & technology*, 50(9), 2004-2012.
- Khandelwal KR. (2006) *Practical Pharmacognosy* (16th ed.,) Nirali Prakashan, Pune. p98-106.
- Likitwattanasade, T. (2009). *Effect of accelerated aging on functional properties of rice grain and flour* (Doctoral dissertation, Kasetsart University).
- Lira, S. M., Canabrava, N. V., Benjamin, S. R., Silva, J. Y. G., Viana, D. A., Lima, C. L. S., & Guedes, M. I. F. (2017). Evaluation of the toxicity and hypoglycemic effect of the aqueous extracts of *Cnidioscolus quercifolius* Pohl. *Brazilian Journal of Medical and Biological Research*, 50(10).
- Mashayekh, M., Mahmoodi, M. R., & Enterazzi, M. H. (2008). Effect of fortification of defatted soy flour on sensory and rheological properties of wheat bread. *Int. J. Food Sci. Technol.* 43, 1693-1698.
- Momoh, A. T., Abubakar, M. Y., & Ipinjolu, J. K. (2012). Effect of ingredients substitution on binding, water stability and floatation of farm-made fish feed. *Int. J. Fish. Aquat. Stud.* 4(3), 92-97.
- Okaka, J. C., & POTTER, N. N. (1977). Functional and storage properties of cowpea powder-wheat flour blends in breadmaking. *Journal of Food Science*, 42(3), 828-833.



- Patel KK. (2005) Master dissertation. *Shorea robusta* for burn wound healing and antioxidant activity. Department of Pharmacology, KLESS College of Pharmacy, Karnataka, India, p.33.
- Pearson D. (1976) *The Chemical Analysis of Food*, 17th ed. Churchill Livingstone, London.. pp 3-4.
- Potter, N.N. and J.H. Hotchkiss. (1997). *Food Science*. CBS Publishers, New Delhi, India. pp: 403.
- Prieto, P., Pineda, M., & Aguilar, M. (1999). Spectrophotometric quantitation of antioxidant capacity through the formation of a phosphomolybdenum complex: specific application to the determination of vitamin E. *Analytical biochemistry*, 269(2), 337-341.
- Ranganna, S. (1986). *Handbook of Analysis and quality control for fruit and vegetable products*. 2nd edn. Tata McGraw Hill Publication company, Ltd, *New Delhi*, 211 – 241.
- Rosniyana, A., & Hazila, K. K. (2013). Nutritional properties and organoleptic acceptability of traditional cakes made from MR 220 rice flour. *J Trop Agric Food Sci*, 41, 41-52.
- Sulochana S. *et al.* A study on phytochemical evaluation of traditional rice variety of Tamil Nadu -'Maappillai Samba' by GC-MS Int. J. Pharma. Bio. Sci. (2015)
- Sadasivam, S., & Manickam, A. (1997). *Biochemical methods*. 2nd edn. New age international (p) Ltd. *Publisher, New Delhi*, 5 – 207.
- Sadasivam, S., & Manikam, A. (1992). *Biochemical method for agricultural sciences*, Willey, *Eastern Ltd*. 105.
- Sofowara, A. (1993). *Medicinal plants and Traditional medicine in Africa*. Spectrum Books Ltd, Ibadan, Nigeria. p. 289.
- Suraiya Jamal., Qazi, I. M., & Ahmed, I. (2016). Comparative studies on flour proximate compositions and functional properties of selected Pakistani rice varieties: Comparative studies on flour proximate compositions and functional properties. *Proceedings of the Pakistan Academy of Sciences: B. Life and Environmental Sciences*, 53(1), 47-56.
- Tester, R. F., & Debon, S. J. (2000). Annealing of starch—a review. *International journal of biological macromolecules*, 27(1), 1-12.
- Trease, G. E., & Evans, W. C. (1989). *Pharmacognsy*. 11th edn. Brailliar Tiridel Can. Macmillian publishers.
- Velavan, S. (2011). Free radicals in health and diseases-A Mini Review. *Pharmacologyonline Newsletter*, 1, 1062-1077.
- Wadchararat, C., Thongngam, M., & Naivikul, O. (2006). Characterization of pregelatinized and heat moisture treated rice flours. *Agriculture and Natural Resources*, 40(6 (Suppl.)), 144-153.
- Weiss, E. A. (2000). *Oilseed Crops*. 2nd ed. Blackwell Science Ltd. Victoria, Australia, pp. 165-203.
- Xiao, J. (2017). Dietary flavonoid aglycones and their glycosides: Which show better biological significance?. *Critical reviews in food science and nutrition*, 57(9), 1874-1905.
- Yadav, R. N. S., & Agarwala, M. (2011). Phytochemical analysis of some medicinal plants. *Journal of phytology*, 3