



REVIEW ARTICLE

Nutraceutical Values of Few Underutilized Fabaceae Species – A Mini Review

Kavitha Sagar, Sharanabasav Amarappa

Abstract

Today's developing world is suffering from under nutrition due to the culture of fast foods, junk foods and adulterated of fruits and vegetables in order to earn more within less time. Proper and timely availability of the unadulterated fresh fruits, vegetables and other nutritious foods are not reaching people. With the increasing population and fast depletion of natural resources, it became necessary to explore the possibilities of using newer indigenous plant resources. There are many plants species still lying unexplored and underexploited. Underutilized plants, in general, constitute those plant species that occur as life support species in extreme environmental conditions and threatened habitats, having genetic tolerance to survive under harsh conditions and possess qualities of nutritional and/or industrial importance for a variety of purposes. The present paper is a review of underutilized Fabaceae species of India. This review may help attend the drawback of mainstream researches which did not provide solutions to agronomic and post-harvest constraints, nor did it develop attractive value added products for a broader market in India.

Keywords: Fabaceae, Nutritional value, Underutilized, unexplored, underexploited.

Introduction

The family Fabaceae is one of the third largest (Legume) families in flowering plants, which includes 751 Genera and 19000 species in world (Christenhusz *et al.* 2016). In India 147 genera 805 species (M Sanajppa *et al.* 1991). Majority of the species are highly economical and are the major crops of India and world. Legumes vary in habit from annual and perennial herbs to shrubs, trees, vines/lianas, and even a few aquatics. Ranging in size from some of the smallest plants of deserts and arctic/alpine regions to the tallest of rain forest trees. Legumes are conspicuous and often dominant component of most of the vegetation types distributed throughout temperate and tropical regions of the world. Legumes are particularly diverse in tropical forests and

temperate scrublands with a seasonally dry or arid climate. This preference for semi-arid to arid habitats is related to a nitrogen demanding metabolism.

Legumes are important sources of nutrients and can serve as high quality dietary protein sources to meet nutrient requirements (Perumal *et al.* 2001). These plants legumes high in protein content, energy values, vitamin and mineral content and have been recognized as “meat of poor people”. Underutilized wild edible Plants (UWEP) are identified as minor, neglected, local, orphan, promising species that have been used for centuries for their food, fiber, fodder, oil or medicinal purposes. Many neglected and underutilized species are nutritionally rich and adapted to low input agriculture. The erosion of these species can have immediate consequences on the nutritional status and food security of the poor (Jyotsna Salvi *et al.* 2016).

According to the World Health Organization (WHO), 462 million adults are underweight, while 1.9 billion adults are overweight and / or obese. In children under 5 years of age, 155 million are stunted, 52 million are wasted, 17 million are severely wasted and 41 million are overweight and / or obese (Natisha Dukhi 2019).

In the South Asian region, India is one of the fastest growing countries economically, educationally, and technologically. Despite economic progress, India has failed to combat malnutrition that adversely affects the country's socio-economic progress. More than one-third of the world's

Department of Studies in Botany, Vijayanagara Sri Krishnadevaraya University, Ballari, Karnataka, India.

***Corresponding Author:** Kavitha Sagar, Department of Studies in Botany, Vijayanagara Sri Krishnadevaraya University, Ballari, Karnataka, India., E-Mail: kavcsa@gmail.com

How to cite this article: Sagar, K., Amarappa, S. 2024. Nutraceutical Values of Few Underutilized Fabaceae Species – A Mini Review. J. Indian bot. Soc., Doi: 10.61289/jibs2024.10.28.1116

Source of support: Nil

Conflict of interest: None.

Table 1: Comprehensive data of Nutraceutical values

Sl. No.	Name of the Plant	Part used	Description	Nutrients	References
1.	<i>Vigna umbellata</i> (Thunb.) Ohwi & H.Ohashi	Seeds	<i>Vigna umbellata</i> is an annual legume. It is a semi-erect or twining herb with extensive root system taproot. The stems are branched and with fine hair. The leaves are trifoliate with entire, oblong leaflets. The flowers are bright yellow, axillary racemes, are papilionaceous. The fruits are cylindrical, long pods. contain 6-10 oblong seeds.	Moisture (%) Total Carbohydrates (%) Crude Protein (%) Fat (%) Crude Fibre (%) Ash (%) Ca (mg/ 100 g) P / 100 g) Fe (mg /100 g) Free reducing sugars (%) Vitamin A	J.C Rana <i>et al.</i> , 2017; Baruah <i>et al.</i> , 2018; Manpreet Kaur 2015; Chavan <i>et al.</i> , 2009; Molhotra <i>et al.</i> , 1988; Lepcha <i>et al.</i> , 2019.
2.	<i>Vigna aconitifolia</i> (Jacq.) Marechal	Seeds	<i>Vigna aconitifolia</i> is a prostrate creeping habit. The main stem is slender, erect. Leaves are alternate, petiolated, trifoliate, deeply lobed. The inflorescence, axillary. Flowers are bright yellow. bisexual, papilionaceous, and The fruit is a hairy, brown or pale grey cylindrical pod,	Moisture (%) Total carbohydrate (%) Crude protein (%) Crude Fat (%) Crude fibre (%) Ash (%) Iron (mg/100 g) Phosphorus (mg/100 g) Potassium K Manganese Mg Calcium Ca Manganese	Opara <i>et al.</i> , 2017; Sharma <i>et al.</i> , 2013; Singh <i>et al.</i> , 2015; Badami <i>et al.</i> , 2019; Soris <i>et al.</i> , 2011; Haytowitz <i>et al.</i> , 2005.
3.	<i>Vigna angularis</i> (Willd.) Ohwi & H.Ohashi	Seeds	It is an annual vine, withan erect to twining growth habit and is usually bushy. Stem is erect. The leaves are trifoliate, ovate to rhomboid leaflets, alternate. The flowers are axillary racemes, bright yellow, papilionaceous. The fruit is pod, small constrictions between the seeds.	Moisture (%) Total carbohydrate (%) - Protein (%) Fat (%) Crude fibre (%) Ash Iron (mg / 100g) Calcium (mg/ 100g)	Adamu <i>et al.</i> , 2016; Yadav <i>et al.</i> , 2018.

4.	<i>Macrotyloma uniflorum</i> (Lam.) Verdc.	Seeds	This is annual climbing herb, stem pubescent, hairs spreading. Leaf trifoliate, broad, ovate rhomboid, obovate or elliptic, obtuse, pubescent. Inflorescence axillary. Fruit: Pod	Moisture (%) Carbohydrate (g) - Protein (g) Fat (%) Fibre (g) Ash (%) Calcium mg/kg Iron (mg/100 g)	9.72, 11.39, 6.72 ± 0.03 68.70, 57.02, 58.32 ± 0.01 23.00, 22.0, 22.12 ± 0.11 2.30, 0.50, 11.39, 1.25 ± 0.10 16.07, 12.14 ± 0.12 3.0 – 3.8, 2.24 ± 0.20 120.00. 11.00	Kanmani <i>et al.</i> , 2018; Gopalan <i>et al.</i> , 1999; Marimuthu <i>et al.</i> , 2013.
5.	<i>Sesbania grandiflora</i> (L.) Pers.	Seeds	<i>Sesbania grandiflora</i> is a fast-growing perennial, deciduous or evergreen legume tree. Roots are nodulated. The leaves, pinnately compound. Inflorescence axillary racemes. The flowers are white, yellowish, pink or red. Fruit: pod.	Moisture Content (%) Crude Protein (%) Crude Fat (%) Crude Fibre (%) Ash (%) Carbohydrate(%CHO)	6.92 ± 0.01, 5.2 . 32.50 ± 0.00, 23.65, 9.60 ± 0.01, 7.4 20.44 ± 0.0, 33.01 4.10 ± 0.00, 8.51, 4.5 26.40 ± 0.02, 51.6	David <i>et al.</i> , 2018; Kumar <i>et al.</i> , 2017; Duke 1983.
6.	<i>Vicia faba</i> L.	Seeds	<i>It is annual plant, stems are, hollow, and unbranched. Faba bean has tillers that grow from the basal nodes. The leaves are alternate, pinnately compound, The leaflets are round or oval. The inflorescence axillary racemes. Flowers papilionaceous. Flowers are large white or white with black/dark purple spots. The fruit is pod,</i>	Moisture (%) Protein (%) Carbohydrates (%) Fibre (%) Oil (%) Ash (%) Ca (mg/100g) - K (mg/100g) - Mg (mg/100g) Na (mg/100g) P (mg/100g) Fe (mg/100g)	18.13 (± 0.11), 26–33. 31.13 (± 0.06) 47.25 (± 0.29) 8.06 (± 0.22), 0.55–1.06. 1.76 (± 0.25) 3.67 (± 0.13), 3.41 392.03 (± 2.91 975.4 (± 1.76) 222.90 (± 1.74) 30.49 (± 1.59) 178.23 (± 1.99) 5.25 (± 0.29), 1.8 – 21.3	Ali <i>et al.</i> , 2014; Alba <i>et al.</i> , 2021.

7.	<i>Mucuna pruriens</i> (L.) DC	Seeds	<i>Mucuna pruriens</i> (L.) DC. is a vine. It is annual plant. trailing or climbing. The stems are slender and slightly pubescent. The leaves are trifoliate, alternate, romboid ovate. The inflorescence is axillary raceme that bears many white to dark purple flowers. seeds are glossy black to white or brownish in colour.	Moisture content (%) Carbohydrate (%) Crude fibre (%) Crude protein (%) Ash content (%) Crude fat (%) K Ca Mg Fe Zn	13.01 ± 0.14 53.47 ± 1.48, 525.6, 49.9-61. 3.92 ± 0.27, 51.6, 8.7-10.5. 29.19 ± 0.14, 314.4, 20.2-29.3 6.47 ± 0.24., 41.1., 3.3-5.5 3.12 ± 0.39, 67.3, 6.3-7.4 778.1-1846.0, 778.1-1846.0, 174.9-387.6, 10.8-15.0, 5.0 – 10.9	Alaye <i>et al.</i> , 2020; Siddharaju <i>et al.</i> , 1996; Vadivel <i>et al.</i> , 2022.
8.	<i>Canavalia ensiformis</i> (L.) DC	Seeds	It is annual shrubby twinner. Stem-glabrous, Leaves trifoliate, ovate. Inflorescence axillary raceme, Flowers are deep pink. Papilionaceous. Fruit- a pod. Seeds white in colour.	Moisture (%) Total fat (%) Fibre (%) Ash (%) Total protein (%) Carbohydrate (%) Phospholipids (%)	12.5, 7.24, 83.3, 2.4, 5.5, 1.59, 1.2, 7.14, 3.98 2.8, 3.88 34.6, 25.31, 10.85 12.15 0.1	Arya <i>et al.</i> , 2015; Solomon <i>et al.</i> , 2018; Patel <i>et al.</i> , 2016.
9.	<i>Rhynchosia minima</i> (Willd.) DC.	Seeds	This plant is subshrubs; branchlets glandular, pubescent. Leaves, trifoliate, ovate, acute, pubescent; Inflorescence: raceme. Flowers yellow; Stigmaphyllon. Pod oblong, puberulus to glabrous; seeds 1 or 2.	Moisture (%) Crude protein (N * 6.25) (%) Carbohydrate (%) Crude Lipid (%) Dietary fibre (%) Ash (%) Calcium (mg 100g-1) Magnesium (mg 100g-1) Phosphorus (mg 100g-1) Zinc (mg 100g-1) Manganese (mg 100g-1) Iron	10.5 ± 0.52 12.8 ± 0.36, 14.28 – 19.40 60.29 – 72.51%. 3.3 ± 0.12, 3.28 – 4.41. 9.8 ± 0.38, 6.39 – 8.44. 2.4 ± 0.07, 2.80 – 3.50. 160.3 ± 0.78 160.5 ± 0.75 174.1 ± 0.32 4.1 ± 0.11 8.4 ± 0.13 6.2 ± 0.14	Arinathan <i>et al.</i> , 2009; Kalidas <i>et al.</i> , 2012.

10.	<i>Rhynchosia suaveolens</i> (L.f.) DC	Seeds (g/100g)	Annual undershrub. Stem apubescens, herbaceous. Leaves alternate, trifoliate; Flower-cluster stalks arise in leaf-axils, 2-flowered. Flowers yellow; papilionaceous. Stamens are diadelphous; anthers uniform. Stigmaticapitate. Fruit is pod.	Moisture Crude protein (N * 6.25) Carbohydrate (%) Crude lipid Dietary fibre Ash Calcium (mg/100g) Magnesium (mg/100g) Phosphorus (mg/100g) Zinc (mg/100g) Manganese (mg/100g) Iron (mg/100g)	5.1 ± 0.11 14.8 ± 0.07, 14.28 – 19.40 60.29 – 72.51% 3.2 ± 0.13, 3.28 – 4.41 8.4 ± 0.17, 6.39 – 8.44. 4.1 ± 0.14, 2.80 – 3.50. 210.2 ± 0.30 94.3 ± 0.66 278.2 ± 0.21 3.5 ± 0.01 7.4 ± 0.11 5.3 ± 0.16	Arinathan et al., 2009; Kalidas et al., 2012.
11.	<i>Rhynchosia rufescens</i> (Willd.) DC.	Seed	It is shrub with trailing branches, glandular-hairy. Leaves are trifoliate; ovate, pointed, rounded at base; leaf-stalk long; Flowers are in racemes; Fruit: pod	Moisture (%) Crude Protein (%) Crude lipid (%) Total dietary fibre (%) Ash (%) Na (mg/ 100 g) K (mg 100 g) Ca (mg 100 g) Mg (mg 100 g) Fe (mg 100 g)	5.10 ± 0.01 19.40 ± 0.01 4.41 ± 0.01 8.44 ± 0.03 64.25 34.14 ± 0.03 1849.30 ± 0.13 194.10 ± 0.98 178.36 ± 0.01 9.08 ± 0.01	Kalidas et al., 2012.
12.	<i>Canavalia rosea</i> (Sw.) DC.	Seeds	Herbaceous Vine plant along the beaches. Stem is Woody and branched. Leaves compound, semi succulent, rounded. Flowers purplish to pink in colour. Fruit is pod.	Seeds Moisture (%) Crude Carbohydrate (NFE) (%) Ash content (%) Crude fiber (%) Crude fat (Ether extract) (%) Crude protein (%) K (mg/100g) Ca (mg/100g) Mg (mg/100g) Fe (mg/100g) Zn (mg/100g)	13.94 ± 0.90, 12.24 34.07, 26.98 3.51 ± 0.01, 2.53 9.81 ± 1, 3.84 3.90 ± 0.8, 3.57 48.71 ± 1.02, 50.84 981 301 123 54 15 Leaf 11.06 40.60 8.45 3.99 5.31 30.59 789 468 98 43 13	Aswanthi et al., 2020; Tijani et al., 2019.

13.	<i>Parkia roxburghii</i> G.Don.	Seeds & Mature Pod	It is a tree with taproot system.; Stem- erect , branched, cylindrical, woody;; Leaf is bipinnate, Oblong, entire.; Inflorescence a head of flowers dangling at the end of a peduncle. fruit is a long, flattened legume pod.	Moisture (%) Crude fibre (%) Crude fat (%) Crude protein (N % * 6.25) Na (mg / 100 g) Ca (mg / 100 g) K (mg / 100 g) Mg (mg / 100 g) Fe (mg / 100 g)	Seeds 59.9 20.28 9.50 32.82 51.6 97.47 2400.0 34.7 34.9	Mature Pod 76.1 20.10 0.98 18.46 130.0 170.0 2825 25.58 57.1	Salam <i>et al.</i> , 2009.
14.	<i>Vigna unguiculata</i> (L.) Walp.	Seeds	An annual herb. Stem erect and trailing taproot with many lateral roots extending from it.; Leaves trifoliate, pulvinous.; Inflorescence raceme.; Flowers pink to purple in colour papilionaceous.; Fruit a pod.	Moisture content(%) Protein (%) Fat (%) Carbohydrate (%) Ash (%) Crude Fibre (%) Zn (mg /100g) Ca(mg /100g) Na(mg /100g) Mg(mg /100g) Fe(mg /100g) K(mg /100g) P	11.98, 10.01 ± 0.1, 6.20 ± 0.20, 24.09, 22.5 ± 0.5, 23.30 ± 0.50 1.70, 1.3 ± 0.1., 4.21 ± 0.36 57.02, 33.5 ± 0.2, 62.68 ± 0.58. 2.81, 3.7 ± 0.1, 4.50 ± 0.10 3.94, 1.7 ± 0.1,3.26 ± 0.52 0.27 93.10, 201.61 ± 0.53, 0.19 0.09, 190.22 ± 0.27 11.00, 9.88 ± 0.95 1292.25, 741.15 ± 0.99 498.10	Amadioha <i>et al.</i> , 2019.; Antova <i>et al.</i> , 2014.; Inoboberne <i>et al.</i> , 2014.	

15.	<i>Acacia nilotica</i> (L.) Delile	Seeds	A medium-sized almost evergreen tree.; Stem- erect, branched, solid, woody/gummy.; Leaves- alternate, stipulate, thorns white, petiolate, compound, bipinnate and oblong, entire, uncostate reticulate., Inflorescence: cymose head.; Flowers tiny, clustered together in bright-yellow, hypogynous.; Corolla 4 or 5 petals.; Fruit- a lomentum.	Moisture (%) Carbohydrate (%) Crude fat (%) Crude fibre (%) Crude protein (%) Ash (%) Na (mg / 100 g) K (mg / 100 g) Ca (mg / 100 g) Mg (mg / 100 g) Fe (mg / 100 g) Cu (mg / 100 g) Mn (mg / 100 g) Zn (mg / 100 g)	6.67 ± 0.12, 29.72 ± 0.10 23.33 ± 0.58, 13.6 ± 0.3, 24.77 6.53 ± 0.15, 30.5 30.95 ± 0.85, 21.4 2.80 ± 0.10, 11.67 958.00 ± 8.60, 25.0 ± 0.3 1168.00 ± 62.36, 110.0 ± 1.1 809.00 ± 49.27, 198.0 ± 1.8, 0.96 305.80 ± 81.16, 2.5 ± 0.1, 0.15 213.00 ± 9.50, 18.0 ± 0.3 30.33 ± 1.53, 0.3 ± 0.0 50.00 ± 1.00, 3.0 ± 0.2 148.00 ± 10.00, 2.4 ± 0.0	Mustaphal et al., 2017. Wati et al., 2017. Abbdalla et al., 2014.
16.	<i>Cyamopsis tetragonoloba</i> (L.) Taub.	Seeds	An annual herb, root system – tap root, Stem- erect, branched, hairy, Leaves- Compound, trifoliate, leaflets elliptic, acute. Flowers- purple, Small, papilionaceous. Fruit – pod, compressed.	Moisture (%) Protein (%) Carbohydrate (%) Ash (%) Fat (%) Fibre (%) Fe (ppm) Zn (ppm) Cu (ppm)	10.00, 4.8 - 8.7 33.25, 24.55 ± 0.94, 3.5-5.5 54.72 ± 1.32, 83.3-87.5 4.53, 3.59 ± 0.43., 0.5- 1.3 3.32., 3.06 ± 0.21, 0.5-0.9. 11.06, 9.78 ± 0.44, 1.4- 2.0 465.90 73.31 11.17	Badret al., 2014. Sharma et al., 2017. Murwan et al., 2012.
17.	<i>Bauhinia variegata</i> L.	Seeds	It is an tree, Stem- woody, erected, branched, cylindrical.; Leaves- simple, alternate, rounded lobes, cordate base.; Inflorescence- raceme, axillary. Flowers- least purple marked.; Fruit- pod.	Moisture (%) Protein (%) Carbohydrates (%) Fiber (%) Ash (%)	6.7 ± 0.46 41.9 ± 1.6 28.4 ± 1.6 6.9 ± 0.8 4.8 ± 0.1	Arain et al., 2012.

18.	<i>Trigonella foenum-graceum</i> L.	Seed	An annual herb, stem- erect, herbaceous, aromatic, glabrous.; Leaves- compound, trifoliate, obovate-oblong, stipuled and lanceolated.; Flowers- white or purplish.; Fruit- pod.	Moisture (%) Protein (%) Fat (%) Carbohydrate (%) Ash (%) Fibre (%) Humidity (%)	10.91 ± 0.85, 25.4 2.74 ± 0.35, 27.50 6.33 ± 0.52, 4.50, 7.9 77.04 ± 0.63., 42.26 2.99 ± 0.48, 3.35, 3.38 6.55 4.90	Buba et al., 2015., Sara et al., 2018. Nasri et al., 2007.
19.	<i>Milletia pinnata</i> (L.) Pierre	Cake	It is an tree.; Stem- erect, branched, cylindrical, woody, glabrous.; Leaves – compound, imparipinnate, opposite, ovate – oblong, acute, entire.; Inflorescence- raceme, axillary.; Flowers- purplish. Fruit-pod, compressed.	Crude protein (%) Crude fibre (%) Lignin (%) Ash (%) Ca (mg/kg) P (mg/kg) Mn (mg/kg) K (mg/kg) Mg (mg/kg) Zn (mg/kg) Cu (mg/kg) Fe (mg/kg)	26.3 5.6 2.9 4.9 7 6.2 76 2.3 76 199 12 23	Kumar et al., 2007., Chandrasekaran et al., 1989., Gowda 2000
20.	<i>Senna tora</i> (L.) Roxb.	Leaves	An herb.; stem- erect, branched, subglabrous.; Leaves- paripinnately compound, obovate- oblong shape, more or less pubescence. Flowers – yellow, subsessile, Fruit- a pod.	Moisture (%) Crude fibre (%) Crude fat (%) Carbohydrate (%) Crude protein (%) Ash (%) Ca (mg/100g) Fe (mg/100g) Mg (mg/100g) Zn (mg/100g) Cu (mg/100g)	23 ± 0.52, 70.55., 12.82 + 0.15 54 ± 1.08, 27.07 + 0.10 6.01 ± 0.07., 4.24 2.02 + 0.82 69 ± 2.38, 9.78., 36.60 + 1.10 34 ± 1.16, 10.12., 11.63 + 0.20 15.01 ± 0.63, 14.63., 9.86 + 2.12 2.19, 3.52 + .40 16.45, 0.22 + 0.07 150.8, 0.86 + 0.12 3.4, 0.04 + 0.01 2.5,	Muhammad et al., 2018. Rathore et al., 2019. Kubmarawa et al., 2011.

malnourished children are in India. Half of the world's malnourished children reside in 3 countries: Bangladesh, India, and Pakistan (Jitendra Narayan *et al.* 2018).

According to the Global Hunger Index 2021, India ranks 101 out of 116 countries. The prevalence of malnourished children in India is nearly double and affects the mortality rate, productivity, and economic growth. (Klaus von Grebmer *et al.* 2021). Each year, nearly half of children in India are malnourished and almost a million children die before reaching one month of age. In India, 43% of children under 5 years are underweight and 48% are stunted, due to severe malnutrition (3 out of every 10 children are stunted). World population was growing at a 2 % annual rate from the sixties to the eighties. Since then, world population increased by 2.5 billion people to reach 7.7 billion worldwide in 2019. Population growth is and will remain a driver for food demand in the future, albeit at rates closer to 1 %. Still, it is not the sole driver, as per capita consumption has also been increasing at a rapid pace. The population is becoming one of the key factor for the increasing food insecurity. The demand for the food continuous along the population rate in the Urban areas.

Whole review was done about underutilized edible plant species of Fabaceae. It was found that most of them possess nutraceutical values when compared to the cultivated plants.

Conclusion

From the study it can be concluded that *Vigna umbellata*, *Vigna aconitifolia*, *Vigna angularis*, *Macrotyloma uniflorum*, *Sesbania grandiflora*, *Vicia faba*, *Mucuna pruriens*, *Canavalia ensiformis*, *Rhynchosia minima*, *Rhynchosia suaveolens*, *Rhynchosia rufescens*, *Canavalia rosea*, *Parkia roxburgii*, *Vigna unguiculata*, *Acacia nilotica*, *Cyamopsis tetragonoloba*, *Bauhinia variegata*, *Trigonella foenum – graecum*, *Milletia pinnata* and *Senna tora* are rich in protein, carbohydrate, crude fibre, crude fat, ash. These plants can give more nutrition to the human kind. Underutilized food crops are neglected as they are not so popularly known to the urban world. The present review is an effort to illustrate the nutritional values of underutilized plants of family Fabaceae in order to pave the way to undertake intensive researches on development of baby foods, energy drinks, health drinks etc. Moreover the above mentioned legume plants can be easily cultivated at large scale for further bioprospection investigations. This review throws light on nutritional contents of the plants which can be developed by food industries, agricultural, floristic and horticultural researches to produce more nutritious food that should be made affordable to the local population. Newer technology can also be developed to enhance nutritious values and can transfer technology to the local farmers directly generating revenue. We can recommend it for the further research work.

References

- Adamu AS, Ajayi MG and Oyetunde JG (2016). Inorganic and proximate nutritional composition of common Beans in Nigeria. *European J Pure and Appl. Chem.* ISSN 2398-1385.
- Alaye SA, Layade KT, Omole EB, Onihunwa JO, Joshua DA and Akande (2020). O A Effects of Different Processing Methods on Proximate Composition of *Mucuna Pruriens*. *IJPSAT* **20(2)**: 229-233. ISSN:2509-0119.
- Amadioha AC and Enyiukwu David Nwazuo (2019). Biochemical Composition of Seed and Husk of Cowpea [*Vigna unguiculata* (L.) Walp.] Infected by *Colletotrichum destructivum* O'Gara in Storage. *Annu. Res. Rev. Biol.* **31(1)**: 1-7. ISSN: 2347-565X.
- Ndamitso MM, Mustapha S, Etsuyankpa MB, Ajai AI and Mathew JT 2017 Evaluation of Chemical Composition of *Acacia nilotica* Seeds. *FUW Trends Food Sci Technol* . **12(2)**: 927 – 931. ISSN: 20485170.
- Aswathi V and Abdussalam AK (2020). Determination Of Energy Content, Phytochemical Constituents And Antioxidant Activity Of Potential Wild Edible Legume; *Canavalia Rosea* (Sw.) Dc. From Northern Kerala *Int. J. Curr. Pharm.* 12(1): 5. ISSN- 0975-7066
- Buba F, Ngura U and Abdulrahman A (2015). A Studies on the physicochemical properties of fenugreek (*Trigonella foenum-Graecum* L.). seeds *Der Pharmacia Lettre* 7(3): 104-107. ISSN 0975-5071.
- Chandrasekaran D, Kadirvel R and Viswanathan K (1989). Nutritive value of pungam (*Pongamia labra* Vent) Cake For sheep. *Anim. Feed Sci. Technol* 22: 321-325
- Chinazum IO, Anthony Cemaluk C, Egbuonu and Chiemezim A Obike (2017). Assessment of Proximate, Vitamins, Minerals and Anti-nutrients Compositions of Unprocessed *Vigna aconitifolia* (Moth Bean) Seeds. *Arch. Curr. Res. Int.* **11(2)**: 1-7. ISSN: 2454-7077.
- Christenhusz MJM and Byng JW (2016). The numbers of known plants species in the world and its annual increase *Phytotaxa* **261(3)**: 201-217.
- Daisy Kameng Baruah, Dr Mamoni Das and Dr Rumamoni Bhattacharyya (2018). Formulation and quality evaluation of ricebean (*Vigna umbellata*) based convenient food multi mixes. *International Journal of Home Science* **4(2)**: 216-221.
- David TI, Temitope EO, Michael BO, Opemipo TI, Ayokunle OA, Isaac OA and Oreoluwa BA (2018). Comparative Evaluation of the Proximate Composition of Raw and Fermented Seeds of *Zizania*, *Sesbania* spp. *IOSR J. Agric. Vet. Sci.* **11(6)**: Ver. II. PP20-25. ISSN: 2319-2380.
- Dr. Manpreet Kaur. Chemical Composition of Ricebean (*Vigna Umbellata*) (2015). Effect of Domestic Processing. *Home Science* **5(4)**: ISSN - 2249-555X.
- Dwi H, Aditya PA, Parsaoran S and Linda S (2015). Chemical composition and Phospholipids Content of Indonesian Jack Bean (*Canavalia ensiformis* L.) *Orient J Chem* **31(4)**.
- Ebthag A, Allah MO, Amir MA and Seif MG, Nabila E, Amir Y, Allah M and Osman A (2014). Nutritional Composition And Anti Nutrients Of Two Faba Bean (*Vicia faba* L.) LINES. *Int. J. Adv. Res.* **2(12)**: 538-544. ISSN 2320-5407
- El Nasri, NA and El Tinay (2007). A Functional properties of fenugreek (*Trigonella foenum graecum*) protein concentrate. *Food Chem* **2**: 582–589.
- Ginka A, Antova, Tsvetelina D. Stoilova, Maria M, and Ivanova (2014). Proximate and lipid composition of cowpea (*Vigna*

- unguiculata L.) cultivated in Bulgaria. *J Food Compost Anal.* **33**: 146–152.
- Global food supply and demand (2019). European Commission. No. 16.
- Gopalan C, Ramasastry BV and Balasubramaniam SC (1999). Nutritive value of Indian foods. (Revised and updated) National Institute of Nutrition, Hyderabad 156
- Gowda NKS, Ramana JV, Prasad CS and Singh K (2004). Micronutrient content of certain tropical conventional and unconventional feed resources of Southern India. *Trop. Anim. Health Prod* **36**(1): 77–94.
- Haytowitz, David B, Ahuja, Jaspreet KC., Somanchi and Meena (2005). USDA. USDA National nutrient database for standard reference, release 18. U.S. Department of Agriculture, Agricultural Research Service, Nutrient Data Laboratory, Beltsville, Maryland, United States, <http://www.nal.usda.gov/fnic/foodcomp>.
- Inobeme A, Nlemadim AB, Obigwa PA, Ikechukwu G and Ajai AI (2014). Determination of Proximate and Mineral Compositions of White Cowpea Beans (*Vigna Unguiculata*) Collected From Markets in Minna, Nigeria. *Int. J. Sci. Eng. Res.* **5**(8): ISSN 2229-5518.
- James A and Duke (1983). Handbook of Energy Crops. Ingerciecilia Mayer Labba, Hanne Froxier and Ann sofie Sadberg Nutritional and antinutritional composition of fava bean (*Vicia faba* L., var. minor) cultivars. *Food Res. Int.* **140**: 110038.
- Jekendra Salam, Sahoo UK and Biman KD (2009). Chemical composition and nutritive indices in parkiaroxburghii g. don, a leguminous plant of India. *Indian Journal Agricultural Biochemistry.* **22**(2): 87–93
- Jitendra N, Denny J and Nirupama R (2018). Malnutrition in India: status and government initiatives. *J Public Health Policy.*
- Jyotsna S and Katewa SS (2016). A review: Underutilized wild edible plants as a potential source of alternative nutrition. *Int. J. Bot. Stud.* **1**(4): 32–36 ISSN: 2455-541X.
- Kalidas and C Mohan 2012 Biochemical composition and nutritional assessment of selected under-utilized food legume of the genus *Rhynchosia*. *Int. Food Res. J.* 19(3): 977–984.
- Mahadi 2018 Phytochemical Screening and Proximate Analysis of Ethanolic Leaves Extract of Cassia tora., *J. Sci. Math. Lett.* **6** (10-17): ISSN 2462-2052.
- Kanmani K, Geetha PS, Uma Maheswari T, Vijayalakshmi R and Vanniyarajan C (2018). Proximate analysis of extrudates from horse gram and moth bean. *International Journal of Chemical Studies.* **6**(3): 3425–3427.
- Global Hunger Index., International Food Policy Research Institute. Global nutrition (2016): from promise to impact: ending malnutrition by 2030. Washington, DC: IFPRI.
- Kokori BT, Abdullahi AAAM and Abdullahi AS 2019 Phytochemical and Nutraceutical Potentials of Beach Bean (*Canavalia rosea* SW.) DC Grown in
- Kubmarawa D, Magomya AM, Yebpella GG and Adedayo SA 2011 Nutrient content and amino acid composition of the leaves of Cassia tora and Celtisintegrifolia. *International Research Journal of Biochemistry and Bioinformatics* 1(9) 222–225. ISSN-2250-9941
- Kumar R, Kamra DN, Agarwal N and Chaudhary LC (2007). In vitro methanogenesis and fermentation of feeds containing oil seed cakes with rumen liquor of buffalo. *Asian-Aust. J. Anim. Sci.* 20(8): 1196–1200.
- Lepcha PK, Pittala R and Sathyanarayana N (2019). Morho – physiological and nutritional characterization of Ricee bean (*Vigna umbellata*). OMICS-Based Approaches in Plant Biotechnology 1, 9781119509967.
- Mala Rathore and Hemant Kumar 2019 Nutritional Assessment of Cassia tora Leaves from Different Regions in Rajasthan. *Journal of Advances in Biology & Biotechnology* 22(4) 1–5, ISSN: 2394-1081
- Marimuthu M and Krishnamoorthi K 2013 Nutrients and functional properties of horse gram (*Macrotyloma uniflorum*), an underutilized south Indian food legume. *J. Chem. Pharma. Res.* **5**(5): 390–394. ISSN: 0975 – 7384.
- Mohamed S, Abdalla, Izeldin A, Babiker, Jehan S. Al-Abraham, Afrah E, Mohammed, Mudawi M. Elobeid and Kamal F. Elkhailifa (2014). Fodder Potential And Chemical Composition of Acacia nilotica Fruits For Livestock In The Dry Lands of Sudan. *Int. J. plant, animal and environ. Sci.* **4**(1): ISSN 2231-4490.
- MukhanWati and Anjani (2017). Proximate Composition And Physiochemical Characteristics Of Acacia nilotica and Albizia lebbeck. *Int. J. Inno. Res. Sci. Eng.* **3**(2): 2454–9665
- NatishaDukhi 2019 Malnutrition World Health Organization (WHO). Available from: [https:// who.int/news-room/fact-sheets/detail/malnutrition](https://who.int/news-room/fact-sheets/detail/malnutrition).
- Pallavi Badami, Kasturiba B and Vijay Kumar AG 2019 Proximate composition and antioxidant activity of Mothbean (*Vigna aconitifolia* (Jacq.) Marechal) varieties. *The Pharma Innovation Journal* 8(2) 222–225.
- Perumal Siddhuraju, Karuppanan Vijayakumari and Karnam Janardhanan 1996 Chemical Composition and Protein Quality of the Little-Known Legume, Velvet Bean (*Mucunapruriens* (L.) DC.). *Journal of Agricultural and Food Chemistry* 44 9, ISSN 2636–2641.
- Priyanka Sharma, AmarjeetKaur and Salvir Kour 2017 Nutritional quality of flours from guar bean (*Cyamopsistetragonoloba*) varieties as affected by different processing methods. *Journal of Food Science and Technolog* 54(7) 1866–1872.
- Ramavtar Sharma and Man Mohan Sundria 2013 In The Beans and the Peas. Handbook of proteolyticenzymes (Third edition) .
- Rana JC, Krishnakumar NK, Mohar Singh, Rashmi Yadav, Kuldeep Tripathi, Rakesh Bhardwaj and Gayacharan. Underutilized grain Legumes: Rice bean, Moth bean, Adzuki Bean, Faba Bean and Gram. Regional Expert Consultation on Underutilized Crops for Food and Nutritional Security in Asia and the Pacific. Bangkok, Thailand, November 13–15.
- Ranjeet Patel, Singh RKR, VarunTyagi, Mallesha and Raju PS 2016 Nutritional evaluation of Canavalia ensiformis (Jack bean) cultivated in North East region of India. *International Journal of Botany Studies* 1; Issue 6 18–21, ISSN: 2455-541X.
- Sabahelkheir Murwan K, Abdalla Abdelwahab H and Nouri Sulafa H 2012 Quality Assessment of Guar Gum (Endosperm) of Guar (*Cyamopsistetragonoloba*). *ISCA Journal of Biological Sciences* 1(1) 67–70.
- Sanjappa M 1991 Legumes of India. Bishen Singh MahendraPal Singh, Dehra Dun 1 1 – 338.
- Sara T. Hadi, Mohammed M. Abed, Noor j and Fadhil 2018 Chemical Composition of Trigonella foenum-graecum Seeds and Inhibitory Activity of Their Seeds Oil Against Some Microbes. *International Journal of Life Sciences and Biotechnology* 1(2) 75–83.
- SarfrazArain, NajmaMemon, Muhammad T. Rajput, Syed T. H.

- Sherazi, Muhammad I, Bhanger and Sarfaraz A and Mahesar 2012 Physico-chemical Characteristics of Oil and Seed Residues of *Bauhinia variegata* and *Bauhinia linnaei*. Pak. J. Anal. Environ. Chem 13, No. 1 16-21. ISSN-1996-918X.
- Sarla malhotra, Darshan malik and Kuldip Singh Dhindsa 1988 Proximate composition and antineutritional factors in rice bean (*Vigna umbellata*). Plant Foods for Human Nutrition 38 75-81.
- Shazia Kousar, Farhan Ahmed, Amber Pervaiz and Stefan Bojnec 2021 Food Insecurity, Population Growth, Urbanization and Water Availability: The Role of Government Stability Sustainability 13 12336.
- Sherif EA Badr, Mohamed S, Abdelfattah, Shahinaz H El-Sayed, Ahmed SE Abd El-Aziz and
- Dina M Sakr 2014 Evaluation of Anticancer, Antimycoplasmal Activities and Chemical Composition of Guar (*Cyamopsistetragonoloba*) Seeds Extract. Research Journal of Pharmaceutical, Biological And Chemical Sciences 5(3) 414.
- Shola G, Solomon, Victor T, Okomonda and Obekpaoguch 2018 Nutritional value of raw *Canavalia ensiformis* and its utilization as partial replacement for soybean meal in the diet of *Clarias gariepinus* (Burchell, 1822) fingerlings., Food Science & Nutrition 6 (1) 207-213.
- Soris PT and Mohan VR 2011 Chemical analysis and nutritional assessment of two less known pulses of genus *Vigna*. Tropical and Subtropical Agroecosystems 14(2) 473-484.
- Srinathan V, Mohan VR, Maruthupandian and Athiperumalsami T 2009 Chemical Evaluation Of Raw Seeds Of Certain Tribal Pulses In Tamil Nadu, India. Tropical and Subtropical Agroecosystems 10 287 – 294.
- Uday Kumar, Narasimha Murthy HN, Chandrapal Singh K, Mahadevappa D, Gouri, Rajeshwari YB, Siddeshwara NC, Abdul Mateen and Guruprasad 2017 R. Biomass Yield And Chemical Composition of *Sesbania grandiflora* and *Moringa oleifera*. International Journal of Science, Environment (O) and Technology 6 No 6, 3264 – 3269, ISSN 2278-3687.
- Upasana Yadav, Narpinder Singh, Amritpal Kaur and Sheetal Thakur 2018 Physico-chemical, hydration, cooking, textural and pasting properties of different adzuki bean (*Vigna angularis*) accessions. Journal of Food Science Technology 55(2) 802–810.
- Uttam D, Chavan, Ajim Momin, Jayshing K, Chavan and Ryszard Amarowicz 2009 Characteristics Of Starch From Rice Bean (*Vigna umbellata* L.) Seeds – A Short Report. Polish journal of food and nutrition sciences 59, No. 1, pp. 25-27
- Vadivel V and Janardhan K (2022) Nutritional and anti-nutritional composition of velvet bean: an under-utilized food legume in south India., *Int. J. Food Sci. Nut.* 73(2)