FOODS AND NUTRITION NEWS

Acharya N.G. Ranga Agricultural University

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Unconventional Foods

In his search for foods which could assuage his hunger and provide the nutrients required by him, man has, over the centuries, tamed many wild plants and cultivated them. Today, apart from edible vegetables and fruits, approximately 21 species are feeding human kind and man is depandant for his food supply almost exclusively on these sources. However, a population escalating in leaps and bounds, has increased the demand for foods. It is now recognized that the food base we have at present is narrow and it is necessary to expand it by introducing other food crops into production. A prudent exploitation of the natural resources as well as their conservation is essential.

The annual world demand for protein by the year 2000 has been estimated to be 180 million tonnes and this has to be met for the well being of the world's population. A large proportion of people suffer from *hidden hunger* or micronutrient malnutrition as well as chronic energy deficiency especially in the developing countries. These needs too, have to be addressed. To solve the world's food problem and provide food for its growing millions, man has not only to use all available technology in food and nutrition but also exploit various unconventional foods which already exist but are not utilized for diverse reasons.

Nature has blessed India with a variety of natural surroundings and varying climates which give rise to a tremendous range of foods, specially plant foods. The hilly and forest areas in India are home to a number of plants and trees which can be potential sources of food. The tribal and other local population groups have learnt to utilize available foods both for their own consumption as well as for animal feed. A number of reports reveal that the seeds of many leguminous plants are utilized, after processing, to meet the requirements for protein. Tender shoots and pods of *soobabul* are roasted and used as food. *Adda seeds* have been reported to be used as a snack item after roasting, so also *Moduga seeds* in the Deccan region. Drought resistant crops such as *winged bean* have been used in times of food shortages. In North Eastern India, a number of fleshy edible fungi are picked and used as food by the local inhabitants. A wide variety of green leafy vegetables unknown to urban dwellers and not cultivated, are picked from fields and forests by villagers to be used in their diet. Oils have been extracted from many seeds for consumption. Oils and fats from mango kernel, chilli seed, winged bean etc., are but a few examples. A search for lesser known crops many of which are potentially valuable as human food and animal feed is continuously made by man to maintain a balance between population growth and agricultural productivity, particularly in the tropical and sub tropical areas of the world.

The main drawback in the exploitation of these *lesser known foods* is the presence of toxic principles and non-nutritional factors which vitiate their nutrient quality.

Seeds contain non-nutrients such as saponins, tannins, phytates and enzyme inhibitors which reduce the body's ability to access the nutrients in the seed. Many seeds also contain toxins. Soobabul seeds contain the neurotoxin *mimosine*. Winged bean contains phyto hemagglutinins which cause growth depression. The type and quantity of these antinutrients and toxins vary with species and variety. Many, but not all of these factors are reduced by cooking. Some toxins need elaborate processing methods for elimination. Sometimes minute quantities of the toxic factors remain in the food even after processing and accumulate in the body, giving rise to problems after reaching a certain cut off point. A thorough research in this area of identifying new, unconventional foods, analyzing their nutrient content as well as the non nutrients/toxins present, developing technologies to eliminate the undesirable factors, and designing products which can be safely consumed and popularizing such foods among consumers, is necessary if these unconventional foods have to be utilized to meet man's nutrient and food requirements.

Research

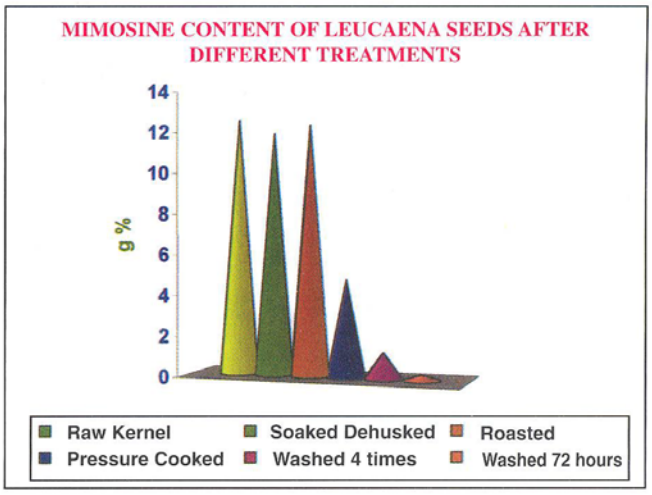
Grains

A study was conducted to evaluate the effect of processing on protein quality and mimosine content of soobabul (Leucaena leucocephla) seeds. These seeds have a high protein content (52.51 %) and the essential amino acid pattern compares favourably with that of FAO reference protein. However, the presence of 12.72 g % of the toxic amino acid, mimosine (β-N (3 hydroxy - 4 oxopyridyl amino propionic acid), vitiates the protein quality.

Procedures like overnight soaking or roasting the raw kernel had no effect on the mimosine content but pressure cooking followed by dehusking reduced it to 4.77 %. Soaking, dehusking, pressure cooking and finally washing in running water for 72 hours reduced it to 0.27%. Weanling rats were fed soobabul seeds given different treatments to determine the protein efficiency ratio. The PER was found to improve as the processing increased, the seed given maximum treatment showing the highest PER of 1.99 which compares well with the PER of other legumes.

Histological studies showed maximum toxic effects in rats fed untreated kernel with higher mimosine content. The toxic symptoms were proportionate to the mimosine content of the diet. The liver, kidney, thyroid and testes showed effects of the toxin. Even the group given the maximum processed seed showed some toxic effect inspite of good weight gain. Thus even after elaborate treatment, the effect of the toxin was seen to a small extent, which is not desirable. Therefore it is necessary to find out easier methods to completely eliminate the mimosine content from the seed in order to use it safely either as animal feed or for human consumption for prolonged periods.

MIMOSINE CONTENT OF LEUCAENA SEEDS AFTER DIFFERENT TREATMENTS



P.Padmavathy and S.Shobha, 1987, AICRP (FN)

An uncommon legume, Butea Frondosa popularly known as "Moduga" in the Deccan region, was analysed for its proximate composition and anti nutritional factors in the raw as well as after different treatments. Treatments used included boiling till cooked, roasting for 15 minutes, solvent extraction for 12 hours, soaking overnight in distilled water, saline and acetic acid. The seeds were rich sources of protein (22 %) and fat (20.8 %). Their tannin content was 125 mg %, trypsin inhibitor content was 1064 TUI/g both being lower than that of common legumes.

Boiling increased the protein content by 1.67 - 14.6 % while other nutrients did not show much change. After treatment there was a decrease in anti nutritional factors in the seeds. Boiling was found to be effective in reducing tannins and trypsin inhibitors while soaking in saline solution was found to be effective for reducing alkaloids. The study indicated that cooking alone is not sufficient for reducing alkaloids and pre treatment like soaking is essential.

K.K.Tulasi and D. Sharada, 1986

Heavy demand for plant protein has necessitated the need to exploit some of the new protein sources to fulfill the increasing demand.

A basic study was conducted to evaluate the protein quality of adda seed (Bauhinia Vahilli) pre dominantly grown in rural areas for afforestation purpose. The leaves of the plant are used for leaf plate making. The seeds which occur in clusters have been reported to be a good source of protein and are used by tribals in

some parts of Andhra Pradesh. Information regarding its protein quality and processing is not reported in literature.

Adda seeds were processed by soaking and drying and converted into fine flour. Nutrient analysis was carried out. Adda seed flour was found to be rich in protein (27 %) and fat (28 %) with iron and phosphorus content of 7.5 mg% and 700 mg% respectively. The flour was found to be a good source of energy (500 Kcals/ 100 g).

Protein quality of adda seed, raw and after heat processing was evaluated by rat feeding study using Net Protein Ratio (NPR) as the parameter. There was total weight loss in rats fed raw adda flour diet as compared with casein diet. The NPR value of control was 3.60 and that of raw, dry and wet processed adda diet, being -2.66, 1.90 and 1.95 respectively. Negative NPR values recorded in case of raw adda was attributed to presence of anti-nutritive factor identified to be gallic acid, a hydrolysable tannin. Primary processing of adda seeds by soaking and dehulling did not reduce the anti-nutritional factor as confirmed by the negative NPR value. The investigation serves as an attempt to study the scope of adda seeds as a protein source. However, there is a need to identify the spectrum of anti-nutritional factors in adda seeds in the light of earlier studies with similar unconventional protein sources.

K. V. Sudhamani and Kamini Devi, 1995.

Some unconventional foods

Winged bean (Psophocarpus tetragonolobus) has been listed as a drought resistant crop of the tropics having high amounts of protein. A study was conducted to determine the proximate composition and anti nutritional factors present in winged bean before and after heat processing. The growth promoting quality of an infant mix made with winged bean and cereal flour combinations were further studied.

The raw winged bean meal was found rich in protein (34.3 %) carbohydrates (38.1 %), fibre (9 %) and ash (8 %). Anti nutritional factors were high, tannis being 3.75 mg/g, trypsin inhibitors 2699.5 TUI/g and phytic acid 2.7 mg/g. Autoclaving for 20 minutes reduced tannins by 66.6 %, trypsin inhibitors by 83.9 % and phytic acid by 100 %.

The winged bean meal was combined with wheat / rice / jowar flours to formulate weaning mixes whose growth promoting qualities were studied on weanling rats. All mixes had low trypsin inhibitor

activity and were low in tannins. Inspite of this, poor food intake and emaciation was noticed in the experimental rats suggesting the presence of some other anti nutritional / toxic factors. Histopathological studies of the visceral organs of the rats showed pathological manifestations caused by the toxic factor in winged bean. It was concluded that further investigations were required to identify and eliminate the toxic factors likely to be present in the winged bean meal before it can be suggested for regular consumption.

K. Thirupathamma & G. Sarojini, 1986.

Iron deficiency anaemia is a major nutritional problem in India especially among low socio economic groups. An iron rich preparation (laddoo) incorporating garden cress seeds (Lepidium sativum) an unconventional source, was formulated and the effect of supplementing it on the iron nutritional status of 7 - 9 year old school children was studied. The product prepared has an iron content of 19.73 mg %and 50 g of the laddoo were supplemented daily to the children for a period of 60 days. After 30 days supplementation itself there was a steady and significant increase in haemoglobin values in all the subjects. By the end of 60 days of supplementation 75 % of children in the 7– 8 years group were normal while 50 % of children in 8 – 9 years age groups reached normal haemoglobin levels. The study revealed that the challenge of reducing iron deficiency anaemia can be fought by choosing iron-rich plant foods than only by animal foods.

Mousmee Sood and D. Sharada, 2000.

Amaranth grain (Amaranthus paniculatus), a pseudo cereal is consumed only in a limited number of places. It's usage is not common in southern India. Keeping in view the high nutrient content and other preferential characteristics, an effort to improve its utility singly or as a supplement to staple cereal was made. Nutrient analysis of the Amaranth grain showed a protein content of 14.6 %, fat content 6.75 % and 16 % dietary fibre. It is rich in the amino acid lysine (5.19 g/ 16 g N). Product development and acceptability tests were carried out. Chikki and laddoo made from popped Amaranth grain scored high for overall acceptability. Popped amaranth grain porridge and snack mixture were also well accepted. However, products like dosa with 75 % amaranth grain and 25 % black gram dhal were found not to be acceptable.

G. Sarojini, N. Nirmalamma, Anurag C, AICRP (FN), 1996

Green Leafy Vegetables

Apart from major green leafy vegetables, non-traditional greens also find a place in Indian culinary in the present day as they provide variety in addition to being potential sources of β carotene, other vitamins and minerals. The Nutrient profile and acceptability of food preparations made using cauliflower and radish leaves was studied. These greens were incorporated at 70 % level in dhal, missi roti, vada, bajji, pakodi, potato curry, egg curry and vadiyam. At 100 % level it was incorporated in pugath and karampodi. Recipes with Spinach were used as control. Sensory evaluation for three consecutive days was conducted by selected panel members using scorecard.

Cauliflower leaves incorporated recipe like dhal with greens, missi roti, pakoda, vada, bajji and vadiyam were well accepted compared to control and radish green recipes. In recipes like egg curry, potato curry, pugath and karampodi, control was better accepted than experimental greens.

The total carotene content of radish and cauliflower leaves was 2.2 mg/100 g and 11.5 mg/100 g respectively. The iron content was 16.2 mg/100 g and 38.9 mg/100 g and the calcium content was 307.5 mg/100 g and 615 mg/100 g respectively.

The carotene content was highest in recipes prepared with radish leaves than control and cauliflower leaves recipe. But the recipes made with cauliflower leaves contained higher calcium and iron than radish leaves product and control.

In stored dehydrated product like karampodi and vadiyam, sensory attributes like colour, flavour, texture and overall acceptability, higher score was obtained by control, followed by cauliflower and radish leaves product which was statistically significant. However quality deteriorated as the storage period increased.

M. Jyothi Shree and Kanwaljit Kaur, 2001.

A study was carried out to estimate nutritive value and test the palatability of the non-traditional leafy vegetables available in Nellore and Prakasham districts of Andhra Pradesh. The leafy vegetables identified through PRA techniques were Chenchalaku (Digera arvensis), Elukajemudaku (Merrenia emarginata), Avisaku (Sesbania grandiflora), gurugaku (Celosia argentia), duradagundaku (Ischnemone indica), thummikura (Lucas aspera), Payilaku (Trianthema portulacastrum), Atikamamidi (Baerhavia diffusa), baddaku (Tinospora cordifolia) and Pippintulu (Acalypha indica).

These non-traditional greens were a rich source of nutrients. The protein content ranged from 2.17 to 6.89 g / 100 g which is higher than other green leafy vegetables while fat content was 0.48 to 1.57 gm %. Total carotenes were maximum in Chenchalaku (47.08 mg %) and minimum in Payilaku (11.73 mg %) while the β carotene content as per cent of total carotene ranged between 30 to 49. Like most green leafy vegetables, these non-traditional greens were rich in ascorbic acid also with contents ranging between 29 mg % to 151 mg %. Among minerals, iron content of Atikamamidi was high (35.86 mg %) while Boddaku and Payilaku had relatively lower levels (6.0 mg %). Calcium levels too were fairly good ranging from 198 to 853 mg percent.

Palatability studies were carried out by preparing curry and dhal from these leafy vegetables. Some of the leaves had a slightly bitter taste but most of them were acceptable. Atikamamidi was found to be the most palatable non-traditional green leafy vegetable. It was also rich in nutrients.

Awareness about the usage of these leaves in the diet was low and there is a need to improve this as these leaves are promising in nutritive value.

R. Bharati and K. Uma Maheshwari, 1999

Ten uncommon green leaves were analyzed for their moisture, crude fibre, total ash, protein, ether extractives, carotenes, vitamin C, total iron, phosphorus, calcium and oxalic acid content. Results of analysis showed most leaves to be rich in iron, calcium, phosphorus,

Vitamin C and oxalic acid. Atthelukura (Lactuca runcinata) and Guntajinjaraku (Eclipta alba) had low oxalic acid content. Gulmetakura (Astercantha longi folia) and Guntakalavaraku (Eclipta alba, small variety) contained exceptionally high amounts of iron. Atthelukura and Chenugaku (Cassia occidentalis) were rich sources of beta carotene.

Sheela Udpa and K. Chittemma Rao, 1972

Chekurmanis (Sauropus Androgynus) a less commonly consumed green leafy vegetable, is a rich source of most nutrients. The protein content of the leaves was 7.36 g %. It was a good source of iron (8.8 mg %), calcium (771 mg %), β-carotene (5600 µg) and vitamin C (244 mg). Preparations incorporating the leaf, like dal with greens, bajji, pakodi and chutney were highly acceptable. Popularization of such uncommonly consumed leaves will be a step towards overcoming the major nutritional problems prevalent in our country.

P. Padmavathy and V. Prabhakar Rao, 1979.

Oils

The chemical nature, storability and acceptability of an unconventional oil, mesta oil were investigated. It was found to have low levels of free fatty acids and a low peroxide value. Its iodine value and saponification value were high as compared to groundnut oil. Products prepared from this oil absorbed less oil than those prepared from groundnut oil. They had a good appearance and texture but a characteristic flavour. It was concluded that deodorisation of the oil may improve the acceptability of the products prepared. The alkali neutralized oil may be suitable for the purpose of seasoning vegetable preparations or for shallow frying.

V. Geetha and G. Sarojini, 1983

An uncommonly used oil, chilli seed oil was evaluated for its chemical nature, degree of digestibility, fatty acid composition, presence and nature of toxic factors and effect of the oil on the biological systems. Analysis showed that the oil compared favourably with commonly used edible oils. Rats fed 5 % chilli seed oil showed good growth. The lipid profile of the experimental rats were similar to the control rats. No necrotic changes were seen in the liver, showing non toxicity of the oil. The study suggested that chilli seed oil could be considered for human consumption if its pungency caused by its capsaicin content was reduced.

B. Sarala Reddy and G. Sarojini, 1983.

Chemical and organoleptic studies of products prepared with winged bean oil were carried out. The chemical nature and fatty acid composition of winged bean oil was similar to groundnut oil. The oil contained behenic acid in addition to other fatty acids. Organoleptic studies showed that the products prepared with winged bean oil were as well accepted as those prepared with groundnut oil.

K. Sailaja and G. Sarojini, 1988

Nutritional evaluation of Mesua ferrae kernel oil was carried out. The oil contains a bitter toxic principle *Mesuol* which depresses the functioning of the central nervous system. The physico chemical analysis showed that the crude oil was more viscous and had higher percent of unsaponifiable matter than refined oil. Both crude and refined oil solidified on refrigeration. The levels of both palmitic acid and stearic acid were high in this oil. The level of oleic acid was also high but the linoleic acid content is lower than other edible oils.

The growth performance of weanling rats fed on crude oil was very poor. However, the animals fed on refined oil had a growth comparable to those fed sunflower oil. The serum lipid profiles of the rats fed refined oil were comparable to the reference oil, but those fed crude oil had higher serum lipid levels. Even though total cholesterol level was higher in rats fed refined oil, the HDL cholesterol fraction was also remarkably high. Histopathological studies showed fatty infiltration of livers of rats fed the crude oil.

G. Sarojini, N. Lakshmi Devi and Anurag Chaturvedi, AICRP-FN, 1992

Self supporting, inter faculty course in Food Science & Technology at ANGRAU

A new inter faculty Post Graduate degree programme in Food Science and Technology will be starting during the academic year 2001-02 at Post Graduate & Research Centre. The syllabus for the course was formulated after discussions with experts in the field both within and outside the University. Dr. K. Kailasapathy, Head, Centre for Advanced Foods Research, school of Science, Food & Horticulture, University of Western Sydney, Australia, who visited ANGRAU during February 2001 also took part in discussions held in finalizing the syllabus.

This programme is open to graduates of Agriculture, Veterinary Sciences and Home Science. Dr. Vijaya Khader, Associate Dean was appointed as Programme Director and Dr.D. Sharada, Associate Professor as Core Committee member.

Core committee meeting to finalize syllabus

Participation of Staff in Seminars and Training Programmes

- Dr. Vijaya Khader, Director, CAS presented a paper on ***Food Security for all*** at National workshop on **Food Security and Public Distribution System** conducted at National Institute of Rural Development, Hyderabad on May 28th & 29th 2001.
- Dr. D. Sharada, Associate Professor participated in the National workshop on ***Food Security and Public Distribution System*** conducted at National Institute of Rural Development, Hyderabad on May 28th & 29th 2001.
- Dr. G. Sarojini, Unit Coordinator, AICRP attended a senior level programme on ***Agricultural Scientist Development for Personnel and Organizational Effectiveness*** from 12th – 23rd June 2001 at National Academy of Agricultural Research Management, Hyderabad.
- Dr. Vijaya Khader, Director, CAS attended an interaction meeting cum workshop on Biotechnology, at Extension Education Institute, ANGRAU, Rajendranagar on 19th June 2001.
- Ms. Kanwaljeet Kaur, Assistant Professor attended a training programme on ***Production technology for fruit based carbonated drinks and beverages*** at IARI, New Delhi from 14th – 20th May 2001.
- A project entitled *Studies on Fisher Women in Coastal Eco system of Andhra Pradesh, Karnataka, Tamil Nadu and Kerala* under the leadership of Dr. Vijaya Khader was launched in July 2001.

The first meeting of the project was held on 13th July 2001 Coordinators from different state centres met for discussion of activities. The next Scientific advisory panel meeting cum sensitization workshop was held at Bangalore on 29–31st July 2001 and attended by Dr. Vijaya Khader, Programme Director.

➢ All staff members of the Foods & Nutrition department attended the Annual Conference of Indian Dietetics Association A.P. Chapter held at College of Home Science, Hyderabad on 8th August 2001. Eminent speakers gave lectures on *Cutaneous manifestations of AIDS* and *AIDS and micronutrients.*

ANNOUNCEMENT

A training programme on *Emerging Trends in Functional Foods* will be conducted from 17-11-2001 to 7-12-2001 by the Centre of Advanced Studies, Department of Foods & Nutrition, Post Graduate & Research Centre, College of Home Science, Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad - 500 030. TA, Food and lodging expenses of SAU staff will be met by the organizers. Nominations of trainees may be sent to

Director,
Centre of Advanced Studies,
Post Graduate & Research Centre,
Acharya N.G. Ranga Agricultural University,
Rajendranagar
Hyderabad - 500 030

Last date for the receipt of nominations: **15th September 2001**

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