International Journal of Food, Nutrition and Dietetics

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Indexing Information: Index Copernicus, Poland; ProQuest, USA; Genamics JournalSeek; CiteFactor, USA; Cosmos Impact Factor, Germany etc.

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Organic Farming for Sustainable Food and Nutrition with Rural Empowerment

Sangeeta Ahuja

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Abstract

The organic food is grown or raised can have a major impact on the mental and emotional health as well as the environment. Organic foods often have more beneficial nutrients, such as antioxidants, than their conventionally-grown counterparts and people with allergies to foods, chemicals, or preservatives often find their symptoms lessen or go away when they eat only organic foods. There is a direct mapping of nutrition management and Agriculture. Agriculture plays a very important role for the growth and development of any country. Agriculture is the sedentary human civilization whereas farming created food surpluses that enabled to live in cities. The Organic farming provides an opportunity to achieve sustainable agriculture that has grown out of the conscious efforts contributing towards rural development and livelihoods to farmers without destroying the natural resource basis. This has also benefited in the way as it reduces the environmental impacts of conventional agriculture and increase productivity in small farmers' land holdings and the costly external inputs, and guarantees price premiums for organic products. The scientific and technological inputs have been major drivers of growth and development in agriculture and allied sectors that have enabled us to achieve self-reliant food security with a reasonable degree of resilience even in times of natural calamities, in recent years. In the present times, agricultural development is faced with several challenges relating to state of natural resources, climate change, fragmentation and diversion ofagricultural land to non-agricultural uses, factor productivity and global trade. There is an urgent need to identify the issues of research and strategies for organic research in agri-horticultural sector, integrated farming systems, resource bases and agro-ecological zones. Decision support systems, expert systems and statistical methodologies/ techniques have to be developed in the field of organic farming in order to increase the agricultural production of the country.

Keywords: Small and marginal farmers; Sustainable livelihoods; Decision support system; Nutrition.

Introduction

India has tremendous potential to become a major exporter of agricultural commodities in the international market. During the next decade, the population in developing countries like India, will face changes in climate patterns and variability that will contribute to severe water shortages or flooding, and also will cause shifts in crop growing seasons due to the rising temperatures which in turn will increase shortage in food and distribution of disease vectors, putting populations at greater environmental health risks. Organic agriculture thus, as an adaptation strategy to climate variability, is a concrete and promising option for rural communities and has additional potential as a mitigation strategy. In India, organic farming was started first by the agribusiness entrepreneurs around 2000, supported by the Ministry of Commerce. Initially, organs of the Ministry of Commerce and APEDA to promote organic production of export commodities due to

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new trade regime of Non-tariff barriers linked to residue contaminations and unsafe agri-products and because of premium prices organic enterprises could enjoy. Indian organic initiative therefore started with setting up of regulatory mechanism, necessary for exports, rather than on principles of organic. Traditionally, Indian agriculture is look like an organic culture in many ways. About 75 percent of the farmers are small and marginal, being practicing organic farming by default due to the unaffordable modern agriculture technologies and rain-fed ecosystems. Presently, the farming and farmers are passing through a transitional phase, comprising of several factors and processes, which include both constraints and opportunities. Integrated farming system is the strength of hill farming.

Current scenario of organic farming

At present, organic farming is practiced in 162 countries and 37 million hectares of agricultural land are managed organically by 1.8 million farmers. The current market for organic foods in India is pegged at Rs. 2500 crores, which according to ASSOCHAM, is expected to reach Rs. 6,000 crores by 2015. Thus, a huge potential is seen in the nascent Indian organic sector. Organic products, which until now were mainly being exported, are now finding consumers in the domestic market also [4] (Table 1). In order to feed this larger population, food production must increase by 48.5 percent. India ranks second worldwide in farm output but the economic contribution of agriculture to India's GDP is steadily declining with the country's broad-based economic growth. The contribution of this important sector to the national GDP is declining (14.6%). Still, agriculture is demographically the broadest economic sector and plays a significant role in the overall socio-economic fabric of India.

Table 1: Status of organic products in India (2013-14)

Total quantity exported	**135**
Value of total export	US$ 374 million
Total certified area (including under 5.21 million hectare cultivation, forest and wild harvest)	5.21 million hectare
Organic crops/ commodities/ products produced	Sugarcane, Cotton, Basmati rice, Pulses, Tea, Spices, Coffee, Oil Seeds, Fruits and their value added products, organic cotton fiber, functional food products etc.
Countries importing Indian organic products	EU, US, Switzerland, Canada, South East Asian countries and South Africa.
Share of Indian organic products in export	Oil seeds - Soybean (41%) lead among the products exported followed by Cane Sugar (26%), Processed food products (14%), Basmati Rice (5%), Other cereals & millets (4%), Tea (2%), Spices (1%), Dry fruits (1%).

Experimentation

Rigorous experimentation with survey analysis have been conducted in the various branches of Agriculture and the data have been statistically computed.

Land Holdings

In India, the average holding size is estimated to be 0.32 and 0.24 ha in 2030 and 2050 respectively. 63 percent holdings are below 1 ha accounting for 19 percent of the operated area while over 86 percent of holdings are less than 2 ha account for nearly 40 percent of the area (APCAS, 2010). As per estimates, more than 95% of the holdings will be under the category of small and marginal holders in 2050 (Figs. 1-3)[5,6].

Export Markets: Buying from India

The scenario of the export market shown in Fig. 4 [7]

The Organic produce have lot of beneficial effects. It contains fewer pesticides are often fresher, is better for the environment. Organically raised animals are not given antibiotics, growth hormones, or fed animal by-products. Organic meat and milk are richer in certain nutrients.

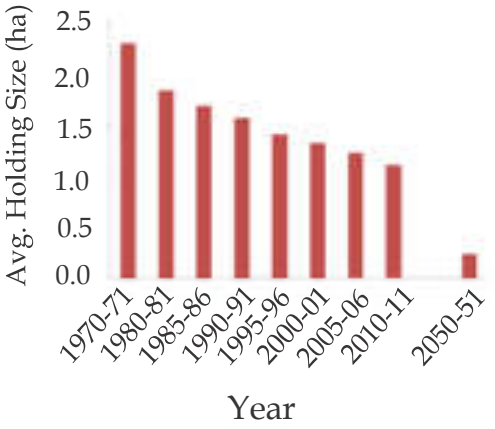

Fig. 1: Decreasing farm land holdings size.

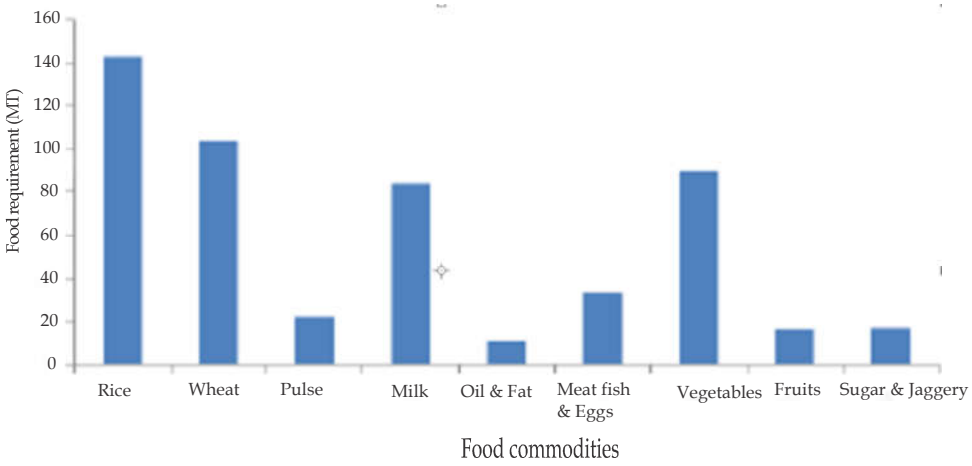

Fig. 2: Food demand projections for 2050

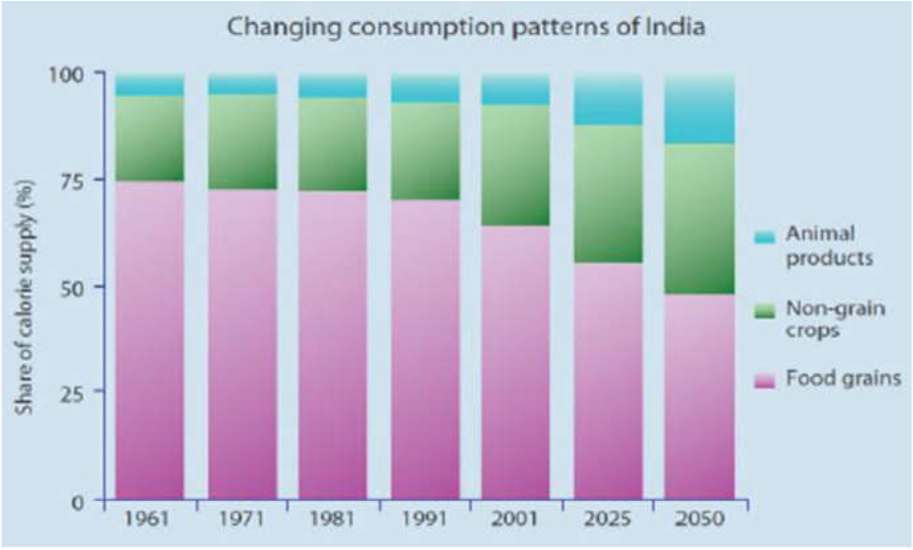

Fig. 3: Changing food consumption pattern

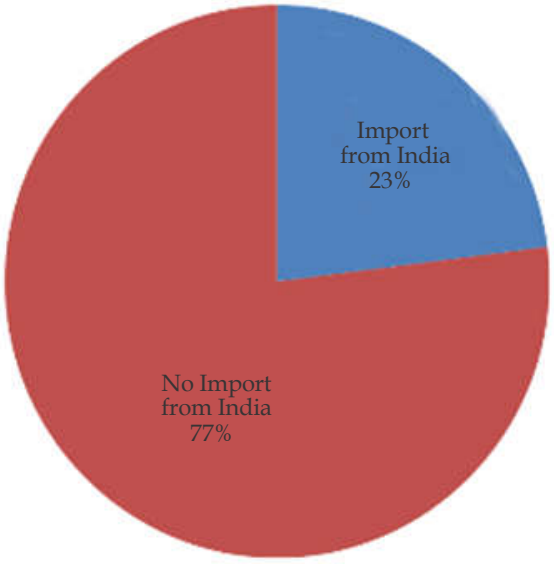

Fig. 4: Export Market

Solution

The solution of good health and nutrition is organic food and vice versa and by implementing the Organic farming in rural places the rural empowerment can be sustained (Fig. 5).

The research and development i.e. the issues & challenges are tackled by departments and institutes of Agriculture viz., SAUs, ICAR Institutes, and KVKs. The comparison of production costs, yields and income of organic and conventional farming systems is needed. The improvement of organic production technologies. More research on inputs to organic farming and make results available to producers and policy makers. The private sector can potentially collaborate with SAUs and ICAR units for developing quality inputs. It is shown in fig. 6.

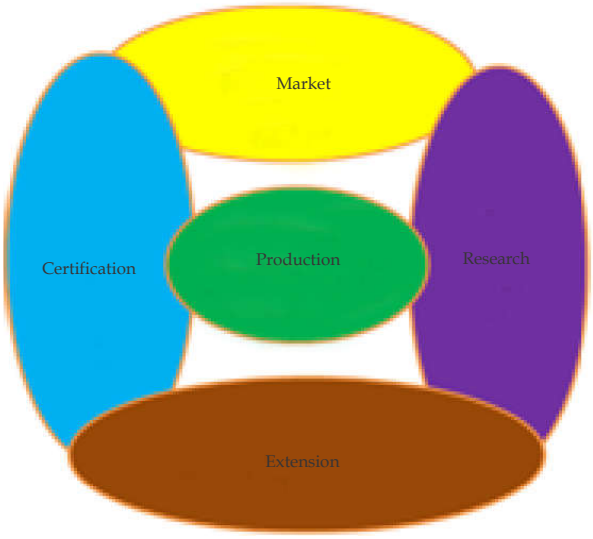

Fig. 5: Solutions of organic agriculture

These are fusion of Technologies for Sustainable Rural Development viz., Database Technology, Internet/Intranet Technology [1-3], GIS and Remote Sensing, Image Processing, GPS, Artificial Intelligence, Decision Support System and Statistical Modeling.

Organic Certification & Accreditation is also needed as shown in Fig. 7.

By 2050, the world's population will reach 9.1 billion, 34 percent higher than today and India will be the most populous country (1.6 billion) on the earth. Urbanization will continue at an accelerated pace (2.4%) and about 50 percent of the India's population will be urban as compared to present 29.5 percent. Currently, India ranks 33rd in terms of total land under organic cultivation and 88th position for agriculture land under organic crops to total farming area. The cultivated land under certification is around 4.43 million ha. At present, India produced around 3.88 million MT of certified organic products including all varieties of

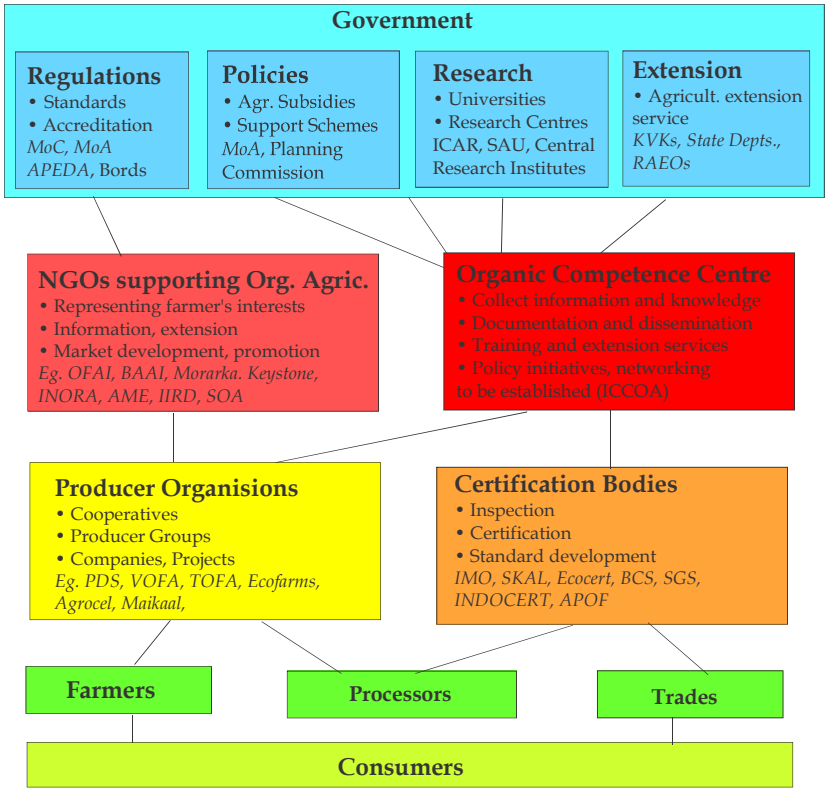

Fig. 6: Implementation

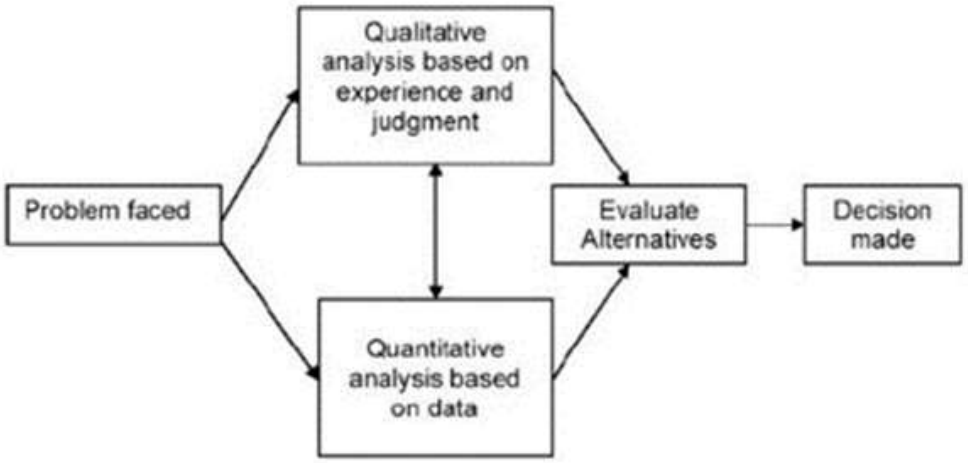

Fig. 7: Decision Making Process

Fig. 8: Decision Support Systems

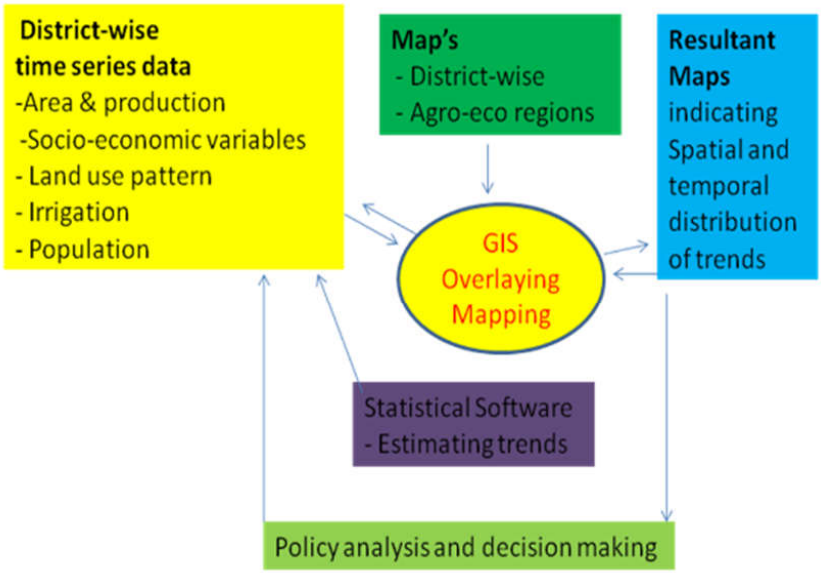

Fig. 9: Spatial decision support for policy decisions for crop productivity management

Fig. 10: Certification

food products. Global consumers are increasingly looking forward to organic food that is considered safe and hazard-free. Global demand for organic products remains robust, with sales increasing by over 5 billion US Dollars a year.

Conclusion

The nutrition with sound health is directly related to organic farming which further leads to rural empowerment. The livelihood of many people are dependent on this field. The survival of mankind without food is not possible on earth so organic farming not only sustain the rural empowerment but very much beneficial for health and nutrition. The application of ICT and their involvement in every stage of production from soil identification to till production. In present scenario, every part of the world is conducting the survey to gather empirical information on crop, livestock and other agriculture resource. Planning and development process of agriculture DSS constitute a multi-complex problem which is very difficult to be solved, if it is not faced thoroughly. The decision making process is demand from producer (information)/ decision maker a qualitative evaluation. The model will lead to make agriculture DSS more appropriate and lead to expected agriculture solution model.

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Nutrimental and Ethnomedicinal Potential Plants of the Qur'an: An Overview - I

T.P. Mall

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Abstract

Our ancient literatures of Hindus', Muslims as well as of Cristian's are full of plants described about their nutrimental and medicinal potential. A significant number of plants described in their texts are still unidentified because of least or no interest in plant taxonomy among neither grate scientists in well-developed different organisations nor respected teachers of Universities or Colleges of repute. We can say with confidence that there are no teachers who can teach Plant Taxonomy in significant numbers of academic institutions. A man of Biotechnology can do nothing if he/she can not identify the plant on which the work has to be worked out. As a result, due to non-identification of plants we cannot use our wealth of knowledge which has been provided by our ancestors present in form of scripts. We were presented a book written by Dr. M.I.H. Farooqi entitled *"Quruani Poudhe-Vagayanic Dhristi Se*" while in Seminar organised by UP Biodiversity Board, Lucknow. We found that there are seventy-one plants being reported in Holy Qur'an and Bible. We have consulted the literatures available as well as the tribal of Bahraich about the uses of the plants available. The perusal of the alphabetical list of plants of Holy Qur'an reveals that there are 71 plant species representing 48 genera of 30 families.Brassicaceae, Cucurbitaceae and Moraceaefamily were found to be the biggest family represented by 6 plant species each whereas Caesalpiniaceae, Papilionoideae and Poaceae with 5 plant species each; Rosaceae and Rhamnaceae with 4 plant apecies; Mimosaceae, Liliaceae, Pinaceae, Euphorbiaceae, Oleaceae, Lytharaceae, Lamiaceae and Arecaceae with 2 plant species and rest fourteen species viz., Malvaceae, Asclepidiaceae, Lauraceae, Bixaceae, Dipterocarpaceae, Juglandaceae, Cuprassaceae, Lecnoraceae, Loranthaceae, Anacardiaceae, Sterculiaceae, Ericaceae, Salvadoraceae, and Vitaceae is being represented by single plant species each.

Keywords: Qur'an; Nutrimental; Ethnomedicinal; Potential Plants.

Introduction

Herbal Medicine is the oldest form of medicine known to mankind. It was the mainstay of many early civilizations and still the most widely practiced form of medicine in the world today.

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Ethnobotany is one of the most interesting themes of economic botany which might have first of all came into the existence probably when earliest man of "stone age" observed the animals mostly the apes and monkeys eating certain plants or plant parts ex. Fruits, leaves and even inflorescences to satisfy their hunger. Therefore, on the basis of plants usage first of all by animals and later on by the human beings the concepts of Ethnobotany and Ethnozoology were evolved, which merged into a common term known as Ethnobiology. However, the term Ethnobotany was first of all used in the last of 19th century by J.W. Harsh Berger (1895) to indicate the interrelationship of plants with aboriginal people or tribal societies [Trivedi and

Sharma, 2011]. In many parts of the world, wild plants are obtained from forests or wild areas designated for extractive resources and managed by local communities [Jadhav *et al*., 2011]. Wild edible plants provide food quantity as well as medicines [Patale *et al*., 2015].

India is one of the twelve mega-biodiversity countries of the World having rich vegetation with a wide variety of plants. As per the 2001 census, the tribal population of India is 8.43 crore, constituting 8.2% of total population of the country [Annual Report, 2005-2006]. With enormously diversified ethnic groups and rich biological resources, India represents one of the great emporia of ethnobotanical wealth [Pal, 2000]. Even today, trial's and certain local communities in India still collecting and preserving locally available wild and cultivated plant species for their day today life [Mahishi, *et al*., 2005 and Ayyanar, *et al*., 2010].

We were presented a book written by Dr. M.I.H. Farooqi entitled *"Quruani Poudhe-Vagayanic Dhristi Se"* while in Seminar organised by UP Biodiversity Board, Lucknow. We found that there are seventy-one plants being reported in Holy Qur'an and Bible. We have consulted the literatures available as well as the tribal of Bahraich about the uses of the plants available. The perusal of the alphabetical list of plants of Holy Qur'an reveals that there are 71 plant species representing 48 genera of 30 families. Brassicaceae, Cucurbitaceae and Moraceae family were found to be the biggest family represented by 6 plant species each whereas Caesalpiniaceae, Papilionoideae and Poaceae with 5 plant species each; Rosaceae and Rhamnaceae with 4 plant apecies; Mimosaceae, Liliaceae, Pinaceae, Euphorbiaceae, Oleaceae, Lytharaceae, Lamiaceae and Arecaceae with 2 plant species and rest fourteen species viz., Malvaceae, Asclepidiaceae, Lauraceae, Bixaceae, Dipterocarpaceae, Juglandaceae, Cuprassaceae, Lecnoraceae, Loranthaceae, Anacardiaceae, Sterculiaceae, Ericaceae, Salvadoraceae, and Vitaceae is being represented by single plant species each. We are enumerating only five plants viz., *Acacianilotica, Acacia senegal, Acacia seyal, Alhgimaurorum* and *Allium cepa* in detail.

Enumeration

1. Acacia nilotica (L.) Delile., Gum arabic tree, Babla; Baboul; Babul; Dauria; Godi; Godi babul; Kabuli kikar; Kaora; KauliaKauria; Kavadi; Kikar; Kikkar; Ram babul; Ramkanta; Ramkati babul; Teli babul; Telia; Telia babul; Vedi; Arabic gum tree; Babul acacia; Blackthorn; Egyptian mimosa; Egyptian thorn; Prickly acacia; Prickly mimosa; Scented thorn; Cented-pod acacia; *Acacia gomifera*; *Acacia a gomme*; *Acacia d'Arabie*; *Acacia de cayenne*; Gommier rouge garad; Sunt; Babul *(Mimosaceae):*

Sub species: *Acacia nilotica subsp. adstringens; Acacia nilotica subsp. cupressiformis, Acacianilotica subsp. hemispherica; Acacia nilotica subsp. indica; Acacia nilotica subsp. kraussiana; Acacia nilotica subsp. leiocarpa; Acacia nilotica subsp. nilotica, Acacia nilotica subsp. subalata; Acacia nilotica subsp. tomentosa.*

Synonymized variety: Acacia arabica var. *indica*; *Acacia arabica* var. *nilotica.*

Acacia nilotica is a pioneer species that is relatively fast growing on arid sites. It is an important riverine tree in India, Sudan and Senegal, where it is planted for timber. Le Houerou (1988) describes native range habitat types for several subspecies, *tomentosa*, *adstringens* and *nilotica*. These are all described in the context of flood plain or water course habitats with varying degrees of flooding. According to Weber (2003), *Acacia nilotica* invades grass and savanna habitats. In Queensland, Australia it has invaded plains of Mitchell grass (*Astrebla* spp.), occurring on soils with a high clay content and sandy loams providing there is sufficient moisture, waterways and seasonally flooded plains including saline areas (Carter, 1998).

Ethnobotanical Potential

Acacia nilotica is popular as an agroforestry tree, either sown in lines 5 m apart in agricultural fields, or on field crop boundaries. As a fodder tree, it is utilized in many different silvi-pastoral systems, and its sweet-smelling pods are particularly sought out by animals. It is extensively used in land rehabilitation, being planted on saline and alkaline soils. It will also grow when irrigated with tannery effluent, or saline water, and effectively colonizes waste heaps from coal mines. The tree is popular as a shelterbelt, and there is interest in *Acacia nilotica* subsp. *cupressiformis* as a windbreak surrounding fields because its narrow crown form produces less shade than other taxa.

It is also a popular ornamental tree, and is frequently planted in India as an avenue tree.

Since the time of the Pharaoh's, large timber trees have been exploited from the riverine forests of the Nile in Sudan and Egypt. At present, forests in the Sudan are managed on a 20-30-year rotation, producing termite resistant timber especially suitable for railway sleepers. In India and Pakistan, the riverine plantations are managed on 15-20-year rotations for fuelwood and timber such as mine props. The strong and durable wood is nearly twice

as hard as teak, and is very shock resistant. It is used for a wide range of construction uses, and in tool handles and carts. Wood properties are reviewed in Rao and Purkayastha (1972), Goldsmith and Carter (1981), Tewari and Rajput (1987) and Troup and Joshi (1983), and its rayon pulp and paper pulp properties in FAO (1980) and Guha *et al.* (1974). The dark brown hardwood has a high calorific value of 4950 kcal/kg, making excellent fuelwood and high-quality charcoal (NAS, 1980).

The pods and leaves have high levels of crude (12.4%) and digestible protein (8%) and energy (7.2 MJ), and are rich in minerals (Le Houerou, 1980). Pods are used as a supplement to poultry rations in India. Dried pods are relished and particularly sought out by animals grazing on rangelands as the pods mature towards the end of the dry season. In India, branches are commonly lopped for fodder. Pods are best fed as a supplement.

A by-product from felling is the bark, which has high levels of tannin (12-20%) used for tanning leathers in India, and the pods of *A. nilotica* subsp. *nilotica* have been used for over 6000 years in Egypt for tanning. *A. nilotica* subsp. *adstringens* is used both for tanning and as a dye in Nigeria.

The gum was originally called gum arabic and has been collected from the Nile forests since the time of the Pharaoh's, for use in paints and medicines. It has some properties similar to those of true gum arabic (from *Acacia senegal*) and is frequently used in calico printing, dyeing, sizing material for silk and cotton and in paper manufacture in India. In Mumbai, India, it is marketed as Amravati gum.

It also has been found to be a powerful molluscicide and algicide, and the fruits, when added to ponds in Sudan, killed snail species which carry schistosomiasis without affecting fish (Ayoub, 1982). The tree is a good host plant for growing lac (shellac) in Sind, Pakistan. An extract of the root is a potential inhibitor of Tobacco mosaic virus. In eastern Java, sprouted seeds are eaten as vegetables, and well-roasted seeds are mixed with coffee (Lemmens and Wulijarni-Soetjipto, 1991). There are many other reported uses (Fagg and Greaves, 1990).

Uses List

Animal feed, fodder, forage: Fodder/animal feed, Invertebrate food for lac/wax insects.

Environmental: Agroforestry, Boundary, barrier or support, Revegetation, Shade and shelter.

Windbreak, Fuels, Charcoal, Fuelwood.

Materials: Carved material, Dye/tanning, Fibre, Gum/resin.

Miscellaneous materials: Poisonous to mammals, Wood/timber, Wood Products, Charcoal, Railway sleepers, Round wood, Building poles, Carpentry/ joinery (exterior/interior) Engineering structures, Exterior fittings, Fences, Flooring, For heavy construction, For light construction.

Industrial and domestic woodware; Tool handles, Wood carvings.

Ethnomedcinal Potential

The tannin content contributes to the many medicinal uses of *A. nilotica*, acting as a powerful astringent**.** Medicinal, pharmaceutical. Source of medicine/pharmaceutical uses.

2. Acacia senegal (L.) Willd., Gum Arabic Tree; Gum Acacia; Gum Senegal Tree; Kumttha; Kumatiyo; Kumat; Kumatio; Khair; Babul; Shvetakhadira (Mimosaceae):

Synonyms: *Acacia verek*, *Mimosa senegal* L., *Senegaliasenegal* (L.) Britton, *Acacia circummarginata* Chiov., *Acacia cufodontii* Chiov., *Acacia glaucophylla* sensu Brenan, *Acacia kiniongesensu* Brenan, *Acacia oxyosprion* Chiov., *Acacia rupestris* Boiss., *Acacia senegal* (L.) Willd. subsp. *modesta* (Wall.) Roberty, *Acacia senegal* (L.) Willd. subsp. *senegalensis* Roberty, *Acacia somalensis*sensu Brenan, *Acacia spinosa* Marloth & Engl., *Acacia thomasii*sensu Brenan, *Acacia volkii* Suess., *Mimosa senegal* L. (L.) Britton.

Gum Arabic tree is a small deciduous acacia tree, native to semi-desert regions of Sub-Saharan Africa, Pakistan, and north-western India. It grows to a height of 5-12m, with a trunk up to 30 cm in diameter. Thorns are placed just below the nodes, either in threes up to 7 mm long, with the middle one hooked downwards and the lateral ones curved upwards, or solitary with the laterals absent. Leaves are double-compound, up to 2.5 cm long. Leaf-axis is finely downy with 2 glands; pinnae are 6–20 pairs; leaflets are small, 7–25 pairs, rigid, leathery, smooth, linear to elliptic-oblong, ciliate on margins, pale glaucous-green, tip blunt to somewhat pointed. Flowers are borne in not very dense spikes 5–10 cm long, carried on stalks 0.7–2 cm long. Flowers are normally produced with the leaves. Sepal cup is bell-shaped, glabrous, deeply toothed. Flowers are white to yellowish, fragrant, stalkless. Pod is straight or slightly curved, ret rap-shaped, 7.5–18 cm long, 2.5 cm wide, thin, light brown or gray, papery or woody, firm, smooth. The tree produces gum arabic, which is

used as a food additive, in crafts, and as a cosmetic. The gum is drained from cuts in the bark, and an individual tree will yield 200 to 300 grams. Seventy percent of the world's gum arabic is produced in Sudan. Flowering: January–March.

Ethnobotanical Potential

Gum arabic is the exudate formed in the bark of *Acacia senegal*, *Acacia seyal* Delile and a few related species. In Sudan and sometimes in international trade, a distinction is made between 'gum hashab' from *Acacia senegal* and 'gum talha' from *Acacia seyal*.

Gum arabic is easily soluble in water and forms solutions over a wide range of concentrations. It has highly valued emulsifying, stabilising, thickening and suspending properties and does not become highly viscous.

The food industry uses 60–75% of the world production. In confectionery, gum arabic is used to prevent crystallisation of sugar, as an emulsifier, and as a glaze or topping in bakery products; in soft drinks and alcoholic drinks it is used either as a vehicle for flavouring or as a stabiliser or clouding agent; in frozen dairy products gum arabic is used for encapsulating flavours such as citrus oils.

Its pharmaceutical use has decreased, but it is still used as a suspending or emulsifying agent and in tablet manufacture, where it functions as a binding agent or as a coating prior to sugar coating.

Gum arabic is used in the printing industry for coating offset lithographic plates to prevent oxidation, to increase their hydrophilic properties and to make them repellent to ink.

It is also a base for photosensitive chemicals. In ceramics, gum arabic helps to strengthen the clay. Other technical applications include pyrotechnics and ink manufacturing.

In textiles, paints, paper size and adhesives (including the traditional office glue and postage stamps) its use has decreased to very low levels in recent years.

Gum arabic is used locally in special dishes and as chewing gum; it has medicinal applications for both humans and livestock, e.g. to treat skin diseases and inflammation.

Acacia senegal is a multipurpose tree. The foliage and pods are an important fodder source for camels and goats.

Seed may be dried and conserved for human consumption mainly as an emergency food.

The wood is used for small-scale construction purposes and agricultural implements; it yields a fuelwood of good quality, that can be made into good charcoal.

The thorny branches are often used to make 'dead fences' to enclose livestock or protect agricultural fields.

Being a very drought-resistant tree, it is planted for sand dune fixation, windbreaks and shelter belts in arid regions.

The flowers are a source of honey.

Cordage is made from the roots, either directly or after beating to extract the fibres; its strength makes it suitable for well ropes and fishing nets.

The seed contains a fat which is used both in medicine and for soap making.

Ethnomedicinal Potential

The gum is used for soothing mucous membranes of the intestine and to treat inflamed skin.

It is also reportedly used as for its astringent properties, to treat bleeding, bronchitis, diarrhoea, gonorrhoea, leprosy, typhoid fever and upper respiratory tract infections.

Bark, leaves and gum are used as an astringent to treat colds, ophthalmia, diarrhoea and haemorrhages.

Environmental impact

Soil binder and soil improver.

Gum arabic trees can help prevent desertification through dune stabilisation and by acting as a wind break. It is valued in agroforestry systems where it is combined with crops such as millet, sorghum, sesame, and groundnut, and where it is reported to improve soil fertility, though its N-fixing status is debated (Orwa *et al*., 2009).

Flowers are a good bee forage; honey amber coloured, very mild aroma, granulates rapidly, within 2 weeks.

Nutritional attributes

Gum arabic tree leaves are of good nutritional value, with a protein content ranging from 15 to 33% of DM when the leaves are fresh. The leaves are also relatively low in fibre (crude fibre 14-25% of DM). The pods are also rich in protein but with a higher fibre content.

Ruminants

Gum arabic tree leaves are a valuable forage for all ruminants except cattle. Though forage yield remains low, leaves are relished by livestock, and provide good quality forage with high protein content and digestibility (in vitro OM digestibility ranges from 66 to 86%), and a low tannin content. Gum arabic tree forage is available at the end of the dry season, when other forages are still scarce. At that time the leaves may account for up to 15-20% of the feed intake of sheep and camelids, and 45% and above for goats. In terms of its relative palatability, *Acacia senegal* ranks highest among local fodder species (Ickowicz *et al.,* 2005).

Pods are palatable to livestock but their consumption destroys seed stocks and may have deleterious effects on stand management (Ickowicz *et al*., 2005). It was shown that only 33% of gum arabic tree seeds could be retrieved from cattle faeces, and only 1% from sheep and goats. Their viability was moreover significantly reduced: 1% germination for seeds found in cattle faeces and no germination for those retrieved from sheep and goats' faeces (Danthu *et al*., 1996).

The most important use of the gum arabic tree is the harvest of gum arabic, an exudate from the bark that is tapped for this purpose during the dry season (Orwa *et al*., 2009). Several thousand tons of gum arabic are internationally traded every year, mainly in Europe and the USA.

Commercial uses

Food, (flavour fixative, emulsifier, stabilizer of dairy products), pharmaceutics (these two sectors representing 60-75% of the use of gum arabic), and industrial products (inks, pigments, polishes).

Gum arabic was reported to have antidotal effects as it can destroy many alkaloids (Duke, 1983).

Acacia senegal seeds are traditionally used for human nutrition in Rajasthan (Ram *et al*., 2014).

The wood is valued as firewood, and can be used to produce charcoal. The wood is also used to make utensils, poles and fence-posts.

The bark and the roots provide fibre and make strong ropes and fishing nets (Orwa *et al*., 2009; Duke, 1983). Gum arabic trees provide valuable fodder to sheep, goats and camels. Leaves and pods are browsed by domestic and wild ruminants. Flowers provide valuable nectar to bees for honey production (Orwa *et al*., 2009).

3. Acacia seyal Del. (**Vachellia seyal** (Delile) Hurter) White galled acacia; Shittim Wood; White Whistling wood (**Caesalpiniaceae):**

Varieties: Vachellia seyal var. *fistula* (Schweinf.) Kyal. & Boatwr.; *Vachellia seyal* var. *seyal* (Delile) Hurter.

Synonyms: *Acacia fistula* Schweinf., *Acacia flava* (Forssk.) Schweinf. var. *seyal* (Delile) Roberty, *Acacia seyal* Delile, *Acacia stenocarpa* Rich.

Tree up to 9 m high with usually flattened crown; bark on trunk powdery, white to greenish yellow or orange red; young branchlets almost glabrous, epidermis reddish, conspicuously flaking off to expose a greyish or reddish powdery under-surface. Stipular spines up to 8 cm long, some sometimes basally inflated and fused into bilobed "ant-galls". Leaves: pinnae 3–7 pairs; leaflets 11–20 pairs, 3–8 x 0.7–1.5 mm. Flowers bright yellow, in heads; involucel in lower half of peduncle, often subtending a few additional flowers. Calyx 2–2.5 mm long. Corolla 3.5–4 mm long. Pods ± falcate and constricted between the seeds, dehiscent, 7–20 x 0.5–0.9 cm, finely longitudinally veined, glabrous. Seeds elliptic, compressed, 7–9 x 4.5–5 mm; areole 5–6 x 2.5–3.5 mm [Thulin *et al*., 1993]

Ethnobotanical Potential

According to some Biblical scholars, the Shittah tree is mentioned in the Bible only once (I will plant in the wilderness, The Shittah tree. Isaiah 41), but its wood is referred to many times as shittium, which is the plural of shittah in Hebrew. Some even speculate that it was only natural that Moses should turn to shittium when he came to build the Ark of the Covenant and the Tabernacle and needed beams and timber. No one can really be sure which species of *Acacia* was meant.

Wood is white to yellow-brown, finely-striated with dark lines, coarse-grained, soft, easy to work, polishes well, but discolours eastly with mold and is susceptible to insect attack.

Ancient Egyptians made coffins, some still intact, from the wood.

Nigerians used sapling stems, or also the roots for spear shafts.

Tree also yields a gum of good quality, inferior to that of *A. senegal*. Systematic tapping has produced a product of better colour and taste.

Bark contains tannin and yields a red liquid extract.

The gum is said to be edible. Eating the gum is supposed to afford some protection against bronchitis and rheumatism (Duke, 1983a).

The leaves are important for forage and the wood for fuel where the trees are abundant.

In parts of Africa the tree is important for livestock, natives driving their animals to where it is common and lopping off branches for them, both leaves and young pods being eaten.

The pods are sold, especially for fattening sheep. The tree is believed to provide the best firewood in Chad, and the best fodder in Sahelian savannas (NAS, 1980a; Duke, 1983a).

It is regarded by the Mbeere as a major bee forage; barrel hives hung in the tree and afforded protection by the very thorny branches from predation by the nratel or honey badger.

The *Acacia seyal* var. *seyal* asan important honey source; honey-white, very mild aroma.

Ethnomedicinal Potential

The bark is used to treat dysentery and bacterial infections of the skin, such as leprosy. The bark is also used as a stimulant [Purdue University].

The gum is used as an aphrodisiac, to treat diarrhoea, as an emollient, to treat haemorrhaging, inflammation of the eye, intestinal ailments and rhinitis. The gum is used to ward off arthritis and bronchitis [Purdue University].

Incense from the wood is used to treat pain from rheumatism and to keep expectant mothers from contracting rhinitis and fevers [Purdue University].

Folk Medicine

The gum is believed to be aphrodisiac.

The bark decoction is used for dysentery and leprosy.

Tanganyikans use the bark as a stimulant in tropical Africa.

The gum is used as emollient and astringent for colds, diarrhoea, haemorrhage and ophthalmia.

Mixed with *Acacia sieberana* DC, it is used for intestinal ailments on the Ivory Coast.

Wood used as a fumigant for rheumatic pains, and to protect puerperal mothers from colds and fevers. Eating the gum is supposed to afford some protection against bronchitis and rheumatism (Duke, 1983a).

Vachellia seyal is, along with other *Vachellias*, an important source for gum arabic, a natural polysaccharide, that exudes from damaged stems and solidifies [Purdue University]. The gum of *Vachellia seyal* is called gum talha, from the Arabic name of the tree: (Talh).

Parts of the tree have a tannin content of up to 18-20%. The bark and seed pods of *Vachellia seyal* var. *seyal* have a tannin content of about 20% [www.fao. org].

Wood from the tree is said to have been used in Ancient Egypt to make coffins and also the Ark of the Covenant [*Vachellia seyal*].

4. Alhagi maurorum Shook, Aqool, ShookEl Jamal, Shprim, Lehlah; Camel thorn bush, Caspian manna, Persian manna; Alhagi des Maures, Kameldorn, Manna-, Mannastrauch; Bharbhara, Jawasa; Lupinellaalhagi, Manna di Persia; Kameeldoringbos, Volstruisdoring [AG Madicinal plants].

Synonyms: *Alhagigraecorum*, *Alhagicamelorum* Fisch., *Alhagipersarum* Boiss. & Buhse, *Alhagipseudalhagi*, *Alhagipseudalhagi* (M. Bieb.) Fisch., *Hedysarumalhagi* L., *Hedysarum pseudalhagi* M. Bieb., *Alhagimaurorum* Medik. subsp. *maurorum*, *Alhagipseudalhagi* subsp. *persarum* (Boiss. & Buhse) Takht., *Alhagicamelorum* var. *spinis-elongatis* Boiss [EOL, 2014; USDA, NRCS, 2010; TF Pakista, 2011; Euromed Plant data base].

It is adeep rooted, rhizomatous, perennial shrub, with roots that can extend six to seven feet into the ground. The spiny, intricately-branched shrub reaches 1.5 to 4 feet in height. The plant, which is grayish green and hairless, has simple, entire leaves that are alternately arranged. The leaf shape is oval to lance-shaped. The small pea-like flowers are pinkish purpleto maroon and are borne on short, spine-tipped branches that arise from the leafaxials. The reddish-brown to tanfruits are found between the seeds, with a short narrow beak at the end [A G Madicinal plants; *Alhagi maurarum*, 2012].

Ethnobotanical Potential

All plant partsincluding the roots are being used in medicines [Ali Esmail Al-Snafi, 2015].

Alhagi maurorum plant is grazed by livestock.

It is cut in late spring andused formaking hay for small livestock and camels [Al-Snafi, 2013 and Bhandari, 2013].

Manna, a sugar exudate, is formed on stems and leaves and shaken from the bushes at flowering.

In Indian markets it is sold under thename (torajabin) and is imported from Afghanistan and Iran.

Today, manna is used for extracting mannitol,

made into tablets and used in the cosmetic and pharmaceutical industries to produce laxatives, diuretics and sweeteners [Brandis, 1972; Bamber, 1916; Maheshwari, 1963 and Thalen, 1979]. It composed from monomeric units mainly consisting of galactose and uronic acids [Goncharov *et al*., 2001].

Ethnomedicinal Potential

The previous studies showed that *Alhagimaurorum* contained many secondary metabolites including flavonoids, fatty acids, coumarins, glycosides, sterols, steroids, resins, vitamins, alkaloids, carbohydrates, tannins, unsaturated sterols and triterpenes. It exerted anti-bacterial, anti-inflammatory, antipyretic, analgesic, antioxidant, gastrointestinal, cardiovascular, diuretic, and dermatological and many other effects [Ali Esmail Al-Snafi, 2015].

Alhagi maurorum is customarily used in folk medicine as aremedy for rheumatic pains, bilharzias is, liver disorders, various types of gastrointestinal discomfort, general tonic, anthelmintic, to treat constipation, jaundice and arthritis.

It also used as diuretic, blood purifier, antimicrobial, for treatment of dysentery, upper respiratory system problems, wounds, haemorrhoids and uterine problems. The roots were used as aphrodisiac [EMP, 2005 and Chakravarti, 1976].

The plant is used as laxative, diuretic and expectorant in India. The oil extracted from leaves is used for curing rheumatism [Singh *et al.,* 1990]. A decoction made from seeds of *Alhagi maurorum*is used for curing kidney stones [Fahmy, 1963].

5. Allium cepa Linn. Common onion, Bulb onion, **(Liliaceae, Amaryllidaceae):**

Synonyms: Allium cepa var. aggregatum G. Don, *Allium cepa var. bulbiferum* Regel, *Allium cepa var. cepa* Linn., *Allium cepa var. multiplicans* Bailey, *Allium cepa var. proliferum* (Moench) Regel, *Allium cepa var. solaninum* Alef, *Allium cepa var. viviparum* (Metz) Mansf. [Linnaeus, 1753 and USDA Plant list].

The onion (*Allium cepa* L., from Latin cepa "onion"), is a vegetable that is the most widely cultivated species of the genus *Allium*. Its close relatives include the garlic, leek, chive, [The Plant List and Chinese onion Block, 2013].

This genus also contains several other species variously referred to as onions and cultivated for food, such as the Japanese bunching onion (*Allium fistulosum*), the tree onion (*A.* ×*proliferum*), and the Canada onion (*Allium canadense*). The name "wild onion" is applied to a number of *Allium* species, but *A. cepa* is exclusively known from cultivation. Its ancestral wild original form is not known, although escapes from cultivation have become established in some regions [Allergy Net, 2010]. The onion is most frequently a biennial or a perennial plant, but is usually treated as an annual and harvested in its first growing season. The onion plant has been grown and selectively bred in cultivation for at least 7,000 years. It is a biennial plant, but is usually grown as an annual. Modern varieties typically grow to a height of 15 to 45 cm (6 to 18 in). The leaves are yellowish- to bluish green and grow alternately in a flattened, fan-shaped swathe. They are fleshy, hollow, and cylindrical, with one flattened side. They are at their broadest about a quarter of the way up, beyond which they taper towards a blunt tip. The base of each leaf is a flattened, usually white sheath that grows out of a basal disc. From the underside of the disc, a bundle of fibrous roots extends for a short way into the soil. As the onion matures, food reserves begin to accumulate in the leaf bases and the bulb of the onion swells [Fritsch and Friesen, 2002].

In the autumn, the leaves die back and the outer scales of the bulb become dry and brittle, so the crop is then normally harvested. If left in the soil over winter, the growing point in the middle of the bulb begins to develop in the spring. New leaves appear and a long, stout, hollow stem expands, topped by a bract protecting a developing inflorescence. The inflorescence takes the form of a globular umbel of white flowers with parts in sixes. The seeds are glossy black and triangular in cross section [Fritsch and Friesen, 2002]. The average pH of an onion is around 5.5 [Brickell, 1996].

The onion plant has a fan of hollow, bluish-green leaves and its bulb at the base of the plant begins to swell when a certain day-length is reached. The bulbs are composed of shortened, compressed, underground stems surrounded by fleshy modified scale (leaves) that envelop a central bud at the tip of the stem. In the autumn (or in spring, in the case of overwintering onions), the foliage dies down and the outer layers of the bulb become dry and brittle. The crop is harvested and dried and the onions are ready for use or storage. The crop is prone to attack by a number of pests and diseases, particularly the onion fly, the onion eelworm, and various fungi cause rotting. Some varieties of *A. cepa,* such as shallots and potato onions, produce multiple bulbs.

Onions are cultivated and used around the world.

As a food item, they are usually served cooked, as a vegetable or part of a prepared savoury dish, but can also be eaten raw or used to make pickles or chutneys. They are pungent when chopped and contain certain chemical substances which irritate the eyes.

Ethnobotanical Potential

Onions are commonly chopped and used as an ingredient in various hearty warm dishes, and may also be used as a main ingredient in their own right, for example in French onion soup, creamed onions, and onion chutney. They are versatile and can be baked, boiled, braised, grilled, fried, roasted, sautéed, or eaten raw in salads [Smith, 2013]. Their layered nature makes them easy to hollow out once cooked, facilitating stuffing them, as in Turkish sogan-dolma.

Onions pickled in vinegar are eaten as a snack around the world, and as a side serving in pubs and fish and chip shops throughout the United Kingdom and the Commonwealth. They are part of a traditional British pub's ploughman's lunch, usually served with crusty bread, English cheese, and ale.

Similar to garlic [Onion Good food, 2013] onions can show an additional colour – pink-red – after cutting, an effect caused by reactions of amino acids with sulphur compounds [Lukes, 1986].

Homeopathic remedies are made from plants, but they also come from some of the foods we eat. Perhaps the most well-known, food-based homeopathic remedy is made from the common red onion and is called *Allium cepa*.

The onion, also called the common onion or bulb onion, is the most cultivated species of the *Allium* genus, and it is related to the leek, garlic, and shallot. Like its other *Allium* family members, onions contain important health-promoting sulphur phytonutrients, such as allyl propyl sulfoxides. As a result, eating onions help boost immunity, treat infections, lower cholesterol, reduce blood pressure, reduce the risk of heart disease, and maintain blood sugar l Onions have particularly large cells that are readily observed under low magnification. Forming a single layer of cells, the bulb epidermis is easy to separate for educational, experimental, and breeding purposes [Lee *et al*., 2012 and Suslov *et al*., 2009].

Onions are, therefore, commonly employed in science education to teach the use of a microscope for observing cell structure [Xu *et al*., 2014].

Onions are toxic to dogs, cats, guinea pigs, and many other animals [Mc Cabe, 2007 and Cope, 2005] evils.

Most onion cultivars are about 89% water, 9% carbohydrates (including 4% sugar and 2% dietary fibre), 1% protein, and negligible fat. Onions contain low amounts of essential nutrients and have an energy value of 166 kJ (40 Calories) in a 100 g (3.5 oz) amount. Onions contribute savoury flavour to dishes without contributing significant caloric content [Ansari, 2007].

Ethnomedicinal Potential

Allium cepa, is used for a wide variety of infections, cold symptoms, allergies, eye irritations, and neuralgic pains.

Allium cepa is often recommended for allergies or allergic rhinitis—also called hay fever Common symptoms include watery eyes, a stuffy nose, sneezing, and a sore throat.

Allium cepa is useful for acute allergy symptoms, especially hay fever with profuse watering of the eyes, and catarrh that irritates and inflames the upper lip and nostrils. Symptoms improve from fresh air and a cool room but worsen from cold or damp weather, and warm rooms.

Let's look a little deeper on how *Allium cepa* helps a stuffy nose and catarrh. The homeopathic remedy is when profuse and watery catarrh also burns the skin of the nose and upper lip. The nose and lip will become raw, red, and very painful. The nose also drips like a faucet, and congestion will alternate between one nostril or both. The person will also experience constant violent sneezing.

Catarrh, a stuffy nose, and violent sneezing are also common symptoms of colds and the flu. As a result, *Allium cepa* is great for infections of all kinds, especially colds, the flu, and chest and throat infections. *Allium cepa* is also an appropriate remedy for sore throats, laryngitis, bronchitis, and a hacking cough that settles in the chest area.

People will have a sensation where the larynx is torn and split due to pain when they speak. Coughing worsens while inside in warm rooms, and during the night. Symptoms can also be brought on by cold air exposure.

Eye irritation is common for people that require *Allium cepa*. The eyes burn and will worsen from coughing. The eyes are also sensitive to light and are itchy and red. The person will also often want to rub their eyes, which will lead to further irritation. Vision will be impaired where near objects appear to be far away.

Neuralgia is a burning, stabbing, and quite often a severe pain that occurs due to a damaged nerve. The damaged nerve commonly occurs in the neck and face. *Allium cepa* is an excellent remedy for neuralgic pains that are accompanied by a burning and piercing pain that will shift from one side of the body to another. The pain may originate with a toothache in the molars, an earache, or a headache at the back of the brow.

The remedy is also given to people that endure phantom limb pains after an amputation. The pain will mainly occur in the face, head, teeth, sinuses, chest, or neck.

The list of possible side-effects that may occur in medicines that contain *Allium cepa* are viz.,

Dermatologic disease, Skin rash, Chronic blistering disease, Gastrointestinal disorder, Heartburn, Dyspepsia, Gastric acidity, Gastroesophageal reflux disease, Swelling, Eye ulceration.

Allium cepa, a spice plant, is commonly known as onion and belongs to the family Liliaceae. Since ancient times, it has been used traditionally for the treatment of different diseases. Among various activities of *Allium cepa*, regulation of hypoglycaemic activity is considered one of its important effects in DM. Sulphur compounds including S-methyl cysteine and flavonoids such as quercetin are mainly responsible for the hypoglycaemic activity of *Allium cepa*. S-methyl cysteine and flavonoids help to decrease the levels of blood glucose, serum lipids, oxidative stress, and lipid peroxidation, as well as increasing antioxidant enzyme activity and insulin secretion. Extracts of onion also have been shown to have hypoglycemic and hypolipidemic effects by normalizing the activities of liver hexokinase, glucose 6-phosphatase and HMG coenzyme-A reductase. In preliminarily clinical trials, patients with diabetes safely consumed slices of *Allium cepa*, exhibiting sufficient hypoglycemic activity [Akash *et al*., 2014].

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Indian Journal of Law and Human Behavior	Semiannual	6000	5500	469	430
Indian Journal of Medical Psychiatry	Semiannual	8000	7500	625	586
Indian Journal of Biology	Semiannual	5500	5000	430	391
Indian Journal of Library and Information Science	Triannual	9500	9000	742	703
Indian Journal of Research in Anthropology	Semiannual	12500	12000	977	938
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Consumer's Knowledge, Attitude and Practices (KAP) Regarding Organic Foods in Relation to Demographic Factors of Punjab

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Abstract

The present study was carried out with an aim to study the knowledge, attitude and practices regarding organic foods on a total of 120 selected subjects (aged between 35 and 45 years) belonging to middle income group (MIG) and high income group (HIG) from two cities of Punjab namely Ludhiana and Patiala The questionnaire consisted of various statements pertaining to knowledge, attitude and practice regarding organic foods. The major sources of information regarding organic foods were found to be television and radio, followed by newspaper, friends, organic shops, farmers and labels, values being 28.3, 18.3, 15.8, 15.8, 12.5 and 9.1%, respectively. Majority of the respondents (88%) strongly agreed that organic foods were healthier than conventional foods. Organic foods were found to be consumed by 96.7 and 93.3% percent of the MIG and HIG subjects respectively of Ludhiana city where as in Patiala city corresponding values were 83.3 and 90% respectively. There was no significant difference in the overall knowledge and attitude score of both MIG and HIG respondents. However, a statistically significant ($p \leq 0.05$) difference was observed in the overall practice score of respondents belonging to MIG and HIG. Hence, it can be concluded that as the income increases the practice of using organic foods also increases.

Keywords: Attitude; Knowledge; Practice; Organic foods; Middle Income group; High Income group.

Introduction

Healthy life style has become a global trend and has been underlined by a slogan 'back to nature'. The environment a lists in 1960s and 1970s concentrated on the effects of chemical fertilizers and pesticides on the biophysical and human health leading to take an alternative food system i.e. organic farming which also hold into account consumer safety. The issues of soil quality, food contamination and conservation of biodiversity was highlighted by the organic food industry [6]. Though the organic products originated in the developed countries, but due to increasing awareness about environmental issues and their alarming effects on health, consumers from developing countries also started accepting the notion of "Go organic". Presently the consumers prefer healthy and high-quality food mainly for two reasons, which are food safety and sustainability. Therefore, the green foods with less chemical residues have become more popular worldwide [3].

Modernization of society has reportedly affected the food choices and preferences of consumers. The consumers very intelligently choose healthy foods because of their improved standard of living and

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education level. This habit of consumers emerged because there has been some apprehensions about the safety of conventional foods which ultimately influenced lifestyle and food habits worldwide [4]. The organic products are environment-friendly so far as the production methods and the final products are concerned.

The consumers demand bundles of characteristics in a product and their choice is influenced by their perception about desirable characteristics of organic foods. In organic market awareness and knowledge are important in two ways. Firstly, a large segment of the population is not yet informed about organic foods. Secondly, the consumers do not have enough detailed information to clearly differentiate the unique attributes of organic from conventionally grown alternatives [5]. The important drive for the growth of organic food market are consumer's knowledge and attitude as well as their practices. So, the present investigation was conducted with an objective to assess and compare the acquired knowledge, attitude and practices of the consumers regarding organic foods belonging to two different income groups i.e. MIG and HIG from two cities of Punjab.

Material and Methods

For the present study, two cities namely Ludhiana and Patiala were selected which represent Central and South-eastern Zones of Punjab, repectively(in the year 2016-17). In each city two localities were selected on the basis of socio-economic status of the families. A total of one hundred and twentysubjects including 60 from Ludhiana and 60 from Patiala city were selected, which comprised of 30 from Middle income group (MIG) and 30 from high income group (HIG) from both the cities (Fig. 1). The selection of subjects was independent of gender. The respondents selected from HIG of both the cities had monthly family income >Rs.1,00,000, while respondents from MIG had monthly family income between Rs.50,000-1,00,000.

The data regarding demographic profile of respondents pertaining to their gender (M/F), age, marital status, education, total family income, religion, type of family, number of family members and locality was recorded.

Assessment of knowledge, attitude and practices (KAP) score

A questionnaire consisting of two parts was developed. First part of the questionnaire contained all the general information of the subjects i.e. demographic profile, socio-economic status, education, marital status etc. Second part of the questionnaire contained a total of 29 questions out of which 10 were regarding the knowledge, 12 regarding attitude and 7 regarding the practice towards organic foods. The questionnaire was developed after thoroughly reviewing the available literature.

Pre- testing of the questionnaire was done on 20 subjects. Thereafter, necessary modifications were incorporated. These 20 respondents were excluded from the final resoondents. The modified questionnaire was then used for data collection by personally interviewing the subjects.

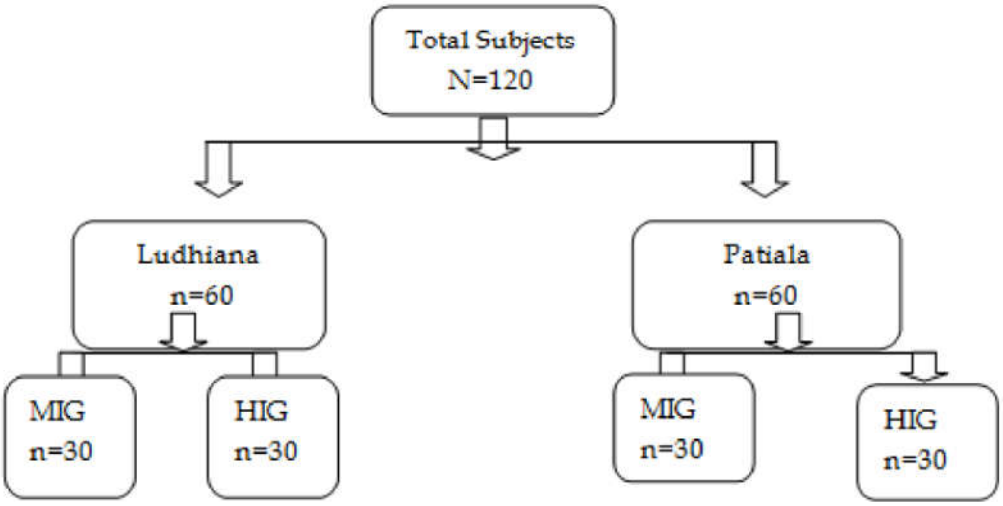

Fig. 1: Selection of subjects

Scoring of Knowledge, Attitude and Practices regarding organic foods

Various statements (as mentioned in Table 3) to check the knowledge of the consumers regarding organic foods were asked and the responses were quantified by a score system from 3 to 1 as given in the following table:

Scoring of Knowledge regarding organic foods

Agreement	Scores
True	3
Do not know	2
False	1

Attitude of the selected respondents towards organic foods was assessed through various statements (as mentioned in Table 4) the results were calculated by a score system from 5 to 1 as mentioned below:

Scoring of Attitude towards organic foods

Agreement	Scores
Strongly agree	5
Agree	4
Neutral/No idea	3
Disagree	2
Strongly disagree	1

Statements regarding practices (as mentioned in Table 5) of the selected subjects towards organic foods were given scores as given below:

Scoring of Practices towards organic foods

Agreement	Scores
Yes	1
No	0
Organic food consumption frequency scores	
Daily	4
Weekly	3
Monthly	2
Rarely	1

Statistical analysis

The collected data was analyzed using various statistical tools such as frequency, percentages and the comparisons between categories of respondents were done using z-test and correlation coefficient of various demographic and socio-economic factors were also calculated.

Results and Discussion

General information

The general information of the respondents i.e. age, gender, marital status, education, religion, type of family, type of residence, occupation and income of the respondents has been presented in Table 1. As evident from Table 1 the age of respondents of both the cities belonging to MIG as well as HIG ranged between 35-45 years. Further, gender distribution showed that 90% of the respondents

Table 1: General profile of the selected respondents (N=120)

Particulars		MIG			HIG		
		Ludhiana (n=30)	Patiala (n=30)	Total (n=60)	Ludhiana (n=30)	Patiala (n=30)	Total (n=60)
Age (years)	35-45	18 (60.0)	23 (76.7)	41 (68.3)	16 (53.3)	19 (63.3)	35 (58.3)
	>45	12 (40.0)	7 (23.3)	19 (31.7)	14 (46.7)	11 (18.3)	25 (41.7)
Gender	Female	26 (86.7)	28 (93.3)	54 (90.0)	26 (86.7)	26 (86.7)	52 (86.7)
	Male	4 (13.3)	2 (6.7)	6 (10.0)	4 (13.3)	4 (13.3)	8 (13.3)
Marital Status	Married	28 (93.3)	29 (96.7)	57 (95.0)	27 (90.0)	28 (93.3)	55 (91.7)
	Unmarried	2 (6.7)	1 (3.3)	3 (5.0)	3 (10.0)	2 (6.7)	5 (8.3)
Education	Primary	1 (3.3)	0 (0.0)	1 (1.7)	0 (0.0)	0 (0.0)	0 (0.0)
	High school	5 (16.7)	2 (6.7)	7 (11.7)	2 (6.7)	0 (0.0)	2 (3.3)
	Graduate	15 (50.0)	15 (50.0)	30 (50.0)	18 (60.0)	12 (40.0)	30 (50.0)
	Post graduate	9 (30.0)	13 (43.3)	22 (36.7)	10 (33.3)	17 (56.7)	27 (45.0)
Religion	Hindu	18 (60.0)	13 (43.3)	31 (51.7)	14 (46.7)	13 (43.3)	27 (45.0)
	Sikh	11 (36.7)	17 (56.7)	28 (46.7)	16 (53.3)	16 (53.3)	32 (53.3)
	Others	1 (3.3)	0 (0.0)	1 (1.67)	0 (0.0)	1 (3.3)	1 (1.7)
Type of family	Joint	7 (23.3)	6 (20.0)	13 (21.7)	4 (20.0)	10 (33.3)	14 (23.3)
	Nuclear	23 (76.7)	24 (80.0)	47 (78.3)	26 (80.0)	20 (66.7)	46 (76.7)
Type of residence	Owned	18 (60.0)	27 (90.0)	45 (75.0)	30 (100.0)	30 (100.0)	60 (100.0)
	On rent	12 (40.0)	3 (10.0)	15 (25.0)	0 (0.0)	0 (0.0)	0 (0.0)
Occupation	Working	22 (73.3)	21 (70.0)	43 (71.7)	28 (93.3)	26 (86.7)	54 (90.0)
	Non- working	8 (26.7)	9 (30.0)	17 (28.3)	2 (6.7)	4 (13.3)	6 (10.0)
Total monthly income	50,000-1,00,000	30 (100)	30 (100)	60 (100)	0 (0.0)	0 (0.0)	0 (0.0)
	>1,00,000	0 (0.0)	0 (0.0)	0 (0.0)	30 (100)	30 (100)	60 (100)

Figures in parenthesis indicate percentage

in MIG and 86.7% in HIG were females. Majority of the respondents were married in MIG and HIG i.e. 95 and 91.7% respectively. In both the income group from both the cities 50% of the selected respondents were found to be graduates while 45% of the HIG subjects and 36.7% of the MIG subjects were educated up to postgraduate level indicating good educational level of the subjects. The majority of the selected respondents in both the cities were Hindu/Sikh. The majority of the selected respondents i.e. 78.3% in MIG and 71.7% in HIG belonged to nuclear families. All the subjects in the HIG had their own houses while 75% MIG had their own houses, while others had rented houses. It was also found that 71.7 and 90% selected respondents form MIG and HIG, respectively were working. All the subjects in MIG were having monthly income between Rs. 50,000-1 lakh and in HIG all the subjects were having monthly income more than Rs. 1,00,000.

Source of information regarding organic foods

As evident from Table 2, 28.3% of the subjects from both the cities found TV/Radio as the major source of information followed by newspaper/ magazines (18.3%), friends/relatives (15.8%), organic shops (15.8%), farmers (12.5%) and labels (9.1%), respectively. It was reported [2] that 28.5% of the respondents used television and radio for obtaining information about organic food products where as newspapers, friends, farmers and other type of information delivery was 14.9, 19.7, 14.3 and 22.6%, respectively. Quality information, labeling and advertisement play important role in enhancement of knowledge [9].

Knowledge, attitude and practices towards organic foods

Knowledge about organic foods

Knowledge can be defined as familiarity or understanding of something such as facts, information and description etc. In the present study knowledge of the respondents was assessed through a series of questions about organic foods and they were asked to state whether the statement were true/false or they do not know. The statement "organic production does not involve use of chemical pesticides and fertilizers" was found to be true by 44% of the total subjects in middle income group of both the cities where as 57% of the higher income group subjects of both the cities found this statement to be true. The organic foods have higher nutrient content and healthier than conventional foods, this statement was found to be true by majority of the respondents of both the income group in both cities (Table 3). The values being 70 and 71.7% respectively in middle and high income group of both the cities. Among the middle income group 51.7% subjects of both the cities found the statement that organic foods can be judged by their appearance as false, where as 41.7% of the high income group subjects found this statement to be true.

Statement regarding no preservatives in organic foods was found to be true by 43.3 and 48.3% from MIG and HIG respectively. However, 35% of the respondents from MIG did not know about presence or absence of preservatives in organic foods. Fifty percent of the respondents from MIG knew that bio fertilizers are used in organic foods where as the corresponding values in HIG was 47.7% for the same statement. Regarding the availability of organic foods majority of the subjects from both the income groups i.e. 46.7 and 58.3% from MIG and HIG respectively stated it false that real organic products can be purchased only from supermarkets, departmental stores or organic food stores. Among MIG subjects 43.3% of the respondents reported it true that only certified and labeled foods are real organic foods. However, 51.7% of the HIG subjects found the same statement to be false. The statement that organic farming can serve as an effective measure for the safety and health of the people was found to be true by a great majority of the subjects in both the income groups (Table 3).

Table 2: Source of information regarding organic foods among middle and high income group subjects of both the cities.

Source of information	MIG (n=60)	HIG(n=60)	Total (N=120)	z-value
Television/Radio	18(30.0)	16(26.7)	34(28.3)	0.41
Newspaper/magazines	10(16.7)	12(20.0)	22(18.3)	0.47
Friends/Relatives	10(16.7)	9(15.0)	19(15.8)	0.25
Organic shops	9(15.0)	10(16.7)	19(15.8)	0.25
Farmers	7(11.7)	8(13.3)	15(12.5)	0.28
Labels	6(10.0)	5(8.3)	11(9.1)	0.32

Figures in parenthesis indicate percentage

Table 3: Knowledge regarding organic foods among middle and high income group subjects of selected cities (N=120)

Statements		MIG (n=60)			HIG (n=60)		
		Do not know	False	True	Do not know	False	True
Organic production does not apply chemical pesticide and fertilizers.	Ludhiana	3 (10.0)	2 (6.67)	25 (83.3)	1 (3.3)	1 (3.3)	28 (93.3)
	Patiala	5 (16.7)	6 (20.0)	19 (63.3)	0 (0.0)	1 (3.3)	29 (96.7)
	z-value	0.76	1.52	1.75	1.01	0	0.59
	Total	8 (13.3)	8 (13.3)	44 (73.3)	1 (1.7)	2 (3.3)	57 (95.0)
Organic food are grown under natural conditions.	Ludhiana	2 (6.67)	26 (86.7)	2 (6.67)	2 (6.7)	27 (90.0)	1 (3.3)
	Patiala	5 (16.7)	20 (66.7)	5 (16.7)	1 (3.3)	23 (76.7)	6 (20.0)
	z –value	1.21	1.83	1.21	0.59	1.39	2.01*
	Total	7 (11.7)	46 (76.7)	7 (11.7)	3 (5.0)	50 (83.3)	7 (11.7)
Organic food has higher nutrition content than conventional food.	Ludhiana	3 (10.0)	0 (0.00	27 (90.0)	12 (40.0)	3 (10.0)	15 (50.0)
	Patiala	10 (33.3)	5 (16.7)	15 (50.0)	1 (3.3)	1 (3.3)	28 (93.3)
	z-value	2.19*	2.34*	3.38**	3.45**	1.04	3.72**
	Total	13 (21.7)	5 (8.3)	42 (70.0)	13 (21.7)	4 (6.7)	43 (71.67)
We can judge if a product is organic or not by its outlook appearance.	Ludhiana	7 (23.3)	15 (50.0)	8 (26.7)	6 (20.0)	9 (30.0)	15 (50.0)
	Patiala	7 (23.3)	16 (53.3)	7 (23.3)	6 (20.0)	14 (46.7)	10 (33.3)
	z-value	0	0.26	0.3	0	1.33	1.31
	Total	14 (23.3)	31 (51.7)	15 (25.0)	12 (20.0)	23 (38.3)	25 (41.7)
There is no preservative in organic food.	Ludhiana	12 (40)	5 (16.7)	13 (43.3)	6 (20)	11 (36.7)	13 (43.3)
	Patiala	9 (30)	8 (26.7)	13 (43.3)	8 (26.7)	6 (20)	16 (53.3)
	z-value	0.81	0.94	0	0.61	1.43	0.78
	Total	21 (35.0)	13 (21.7)	26 (43.3)	14 (23.3)	17 (28.3)	29 (48.3)
Organic farming use bio-fertilizers.	Ludhiana	19 (63.3)	2 (6.7)	9 (30.0)	8 (26.7)	9 (30.0)	13 (43.3)
	Patiala	5 (16.7)	4 (13.3)	21 (70)	9 (30)	6 (20)	15 (50)
	z-value	3.69**	0.86	3.10**	0.29	0.89	0.52
	Total	24 (40.0)	6 (10.0)	30 (50.0)	17 (28.3)	15 (25.0)	28 (46.7)
Real organic products can only be bought in large supermarkets, department stores or organic food stores.	Ludhiana	1 (3.3)	13 (43.3)	16 (53.3)	4 (13.3)	21 (70.0)	5 (16.7)
	Patiala	6 (20)	15 (50)	9 (30)	3 (10)	14 (46.7)	13 (43.3)
	z-value	2.01*	0.52	1.83	0.4	1.83	2.25*
	Total	7 (11.67)	28 (46.7)	25 (41.7)	7 (11.7)	35 (58.3)	18 (30.0)
Only those products with organic certified labels are real organic products.	Ludhiana	2 (6.7)	11 (36.7)	17 (56.7)	3 (10)	16 (53.3)	11 (36.7)
	Patiala	9 (30)	12 (40)	9 (30.0)	5 (16.7)	15 (50)	10 (33.3)
	z-value	2.34*	0.27	2.08*	0.76	0.26	0.27
	Total	11 (18.3)	23 (38.3)	26 (43.3)	8 (13.3)	31 (51.7)	21 (35)
Organic farming can serve as an effective measure for safety and health of the people.	Ludhiana	1 (3.3)	2 (6.7)	27 (90)	3 (10)	1 (3.3)	26 (86.7)
	Patiala	4 (13.3)	2 (6.7)	24 (80)	2 (6.7)	2 (6.7)	26 (86.7)
	z-value	1.4	0	1.08	0.47	0.59	0
	Total	5 (8.3)	4 (6.7)	51 (85)	5 (8.3)	3 (5.00	52 (86.7)
Several organic foods are available in the market.	Ludhiana	1 (3.3)	7 (23.3)	22 (73.3)	4 (13.3)	0 (0.0)	26 (86.7)
	Patiala	12 (40.0)	2 (6.7)	16 (53.3)	3 (10)	2 (6.7)	25 (83.3)
	z-value	3.45**	1.81	1.61	0.4	1.44	0.36
	Total	13 (21.7)	9 (15)	38 (63.3)	7 (11.7)	2 (3.3)	51 (85)

Figures in parenthesis indicate percentage

* Significant at 5% level

** Significant at 1% level

The values being 85 and 86.7% among MIG and HIG, respectively. A higher number of the subjects from HIG i.e. 85% stated that several organic foods are available in the market as true.

Attitude towards organic foods

An attitude is a tendency to respond in a positive or in a negative manner towards a certain idea, object, person or situation. It influences one's choice of action and response to challenges and rewards. In the present study attitude of the selected subjects towards organic foods was assessed by a well structured questionnaire which consisted of 12 statements and the subjects were asked to respond whether they agreed, disagreed or neutral to the mentioned statement. It was found that 46.7% of the MIG subjects and 50% of HIG subjects from Ludhiana city strongly disagreed to the statement that "I am not interested in organics" (Table 4). However, 50% of HIG subjects from Patiala city were neutral to the above mentioned statement. The statement regarding preference of buying organic foods was agreed by 36.7% of the MIG subjects in Ludhiana city where as in Patiala city half of the subjects disagreed to the same statement, where as 26.7% of the higher income group subjects in Ludhiana city and 30% in Patiala city agreed to the same statement. Among the MIG subjects of Ludhiana and Patiala city who agreed to the statement regarding safety and reliability of organic foods was 56.7 and 60% respectively and 50% HIG subjects in Ludhiana city and 30% subjects in Patiala city strongly agreed to the same statement. Similarly, the statement regarding better quality of organic foods was agreed upon by 53.3 and 56.7% of the MIG subjects and 50 and 33.3% of HIG subjects in Ludhiana and Patiala city, respectively. No subjects in both income groups of both the cities disagreed to the statement that "organic products are healthier and more nutritious i.e. all the subjects were aware that organic foods are healthier. It has been reported that majority of the subjects about 88% t strongly agreed that organic foods were healthier than conventional foods and only 2% of consumers disagreed to the statement (Table 4). It was further reported that 10% of the respondents were neutral in this respect.

All the MIG subjects from Ludhiana city and 3.3% in Patiala city strongly agreed to the statement and fifty percent HIG subjects remained neutral to the statement that organic foods are supreme products and consumed only by rich people. Nooripoor *et al.*, (2008) indicated that higher price of organic foods is one of the major barrier to their consumption. All the subjects in both income groups of both the cities strongly agreed to the statement that organic products are available in limited variety in the market. Majority of the respondents i.e. 43.3% in MIG and 40% in HIG in Ludhiana city agreed to the statement that there are a lot of sale points for organic products, where as 50% in MIG and 46.7 in HIG of Patiala city were neutral to the same statement. The statement regarding trust on organic products was agreed upon by 56.7 and 43.3% of the selected MIG subjects from Ludhiana and Patiala city, respectively. However, 46.7% t subjects of Ludhiana city and 40% subjects of Patiala city remained neutral to the statement.

Further, it was also found that all the subjects agreed that organic foods are more nutritious but at the same time all of them agreed that these foods are costlier. Majority of the subjects agreed that organic foods are available in limited variety. On contrary, it was found that a higher number of respondents in Ludhiana city were interested in organic foods and preferred to purchase organic foods as compared to those in Patiala city. The reason for this difference might be that though the respondents in both the cities were well aware about the better quality, safety and nutrition of organic foods but the respondents from Ludhiana were more interested in purchasing organic foods, which might be due to their higher purchasing power and more availability of organic foods in Ludhiana city.

Practices towards organic foods

The practice is the actual application or use of a method/idea/belief as opposed to theories relating to it. Along with the knowledge and attitude, practices towards organic foods adopted by the respondents were also assessed in middle and high income group subjects of both the selected cities. Organic foods were found to be consumed by 96.7 and 93.3% of the MIG and HIG subjects of Ludhiana city respectively, where as in Patiala city values were 83.3 and 90% respectively, indicating that in Ludhiana city income level of selected subjects did not influence their purchase of organic foods, but in Patiala city the subjects from HIG were purchasing more of organic foods (Table 5). Among MIG subjects of both the cities 90% of the respondents stated that they were consuming organic foods while HIG subjects 93.3% of the subjects responded the same. This finding can be correlated well with the attitude of the respondents from both the cities which indicated that more number of subjects in Ludhiana city were interested in purchasing organic foods and all the subjects in both the cities responded that organic foods were costlier.

Table 4: Attitude regarding organic foods among middle and high Income group subjects of selected cities (N=120)

Statements		MIG (n=60)					HIG (n=60)				
		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I am not interested in organic foods	Ludhiana	0 (0.0)	2 (6.7)	9 (30.0)	8 (26.7)	14 (46.7)	0 (0.0)	2 (6.7)	10 (33.3)	3 (10)	15 (50)
	Patiala	1 (3.3)	4 (13.3)	15 (50.0)	7 (23.3)	3 (10)	0 (0.0)	3 (10.0)	11 (36.7)	2 (6.7)	14 (46.7)
	z-value	1.01	0.86	1.58	0.51	3.83**	NA	0.47	0.31	0.52	0.31
	Total	1 (1.7)	6 (10)	24 (40)	15 (25)	17 (28.3)	NA	5 (8.3)	21 (35)	5 (8.3)	29 (48.3)
I prefer buying organic foods.	Ludhiana	0 (0.0)	11 (36.7)	9 (30)	7 (23.3)	3 (10)	11 (36.7)	8 (26.7)	8 (26.7)	3 (10)	0 (0.0)
	Patiala	3 (10)	7 (23.3)	1 (3.3)	15 (50)	4 (13.3)	8 (26.7)	9 (30)	12 (40)	1 (3.3)	0 (0.0)
	z-value	1.78	1.13	2.77**	2.14*	0.40	0.83	0.29	1.10	1.04	NA
	Total	3 (5.0)	18 (30.0)	10 (16.7)	22 (36.7)	7 (11.7)	19 (31.7)	17 (28.3)	20 (33.3)	4 (6.7)	0 (0.0)
Organic products are safer and more reliable.	Ludhiana	0 (0.0)	17 (56.7)	4 (13.3)	1 (3.3)	8 (26.7)	15 (50.0)	11 (36.7)	4 (13.3)	0 (0.0)	0 (0.0)
	Patiala	2 (6.7)	18 (60)	8 (26.7)	2 (6.7)	0 (0.0)	9 (30.0)	10 (33.3)	11 (36.7)	0 (0.0)	0 (0.0)
	z-value	1.44	0.26	1.29	0.59	3.04**	1.58	0.27	2.09*	NA	NA
	Total	2 (3.3)	35 (58.3)	12 (20.0)	3 (5.0)	8 (13.3)	24 (40.0)	21 (35)	15 (25.0)	0 (0.0)	0 (0.0)
Organic products are of better quality.	Ludhiana	0 (0.0)	16 (53.3)	4 (13.3)	3 (10.0)	7 (23.3)	7 (23.3)	15 (50)	8 (26.7)	0 (0.0)	0 (0.0)
	Patiala	1 (3.3)	17 (56.7)	7 (23.3)	5 (16.7)	0 (0.0)	10 (33.3)	10 (33.3)	9 (30.0)	1 (3.3)	0 (0.0)
	z-value	0.21	0.26	1.00	0.76	2.82**	0.86	1.31	0.29	1.01	NA
	Total	1 (1.7)	33 (55)	11 (18.3)	8 (13.3)	7 (11.7)	17 (28.3)	25 (41.7)	17 (28.3)	1 (1.7)	0 (0.0)
Organic products are healthier and more nutritious	Ludhiana	7 (23.3)	15 (50.0)	6 (20.0)	2 (6.7)	0 (0.0)	6 (20.0)	4 (13.3)	15 (50.0)	5 (6.7)	0 (0.0)
	Patiala	4 (13.3)	12 (40.0)	9 (30.0)	5 (16.7)	0 (0.0)	7 (23.3)	6 (20.0)	17 (56.7)	0 (0.0)	0 (0.0)
	z-value	1.07	0.78	0.89	1.21	NA	0.31	0.69	0.52	2.34*	NA
	Total	11 (6.7)	27 (45.0)	15 (25.0)	7 (11.6)	0 (0.0)	13 (21.7)	10 (16.7)	32 (23.3)	5 (8.3)	0 (0.0)
Organic products are very expensive.	Ludhiana	0 (0.0)	11 (36.7)	6 (20.0)	6 (20.0)	7 (23.3)	13 (43.3)	7 (23.3)	9 (30.0)	1 (3.3)	0 (0.0)
	Patiala	0 (0.0)	12 (40.0)	13 (43.3)	5 (16.7)	0 (0.0)	6 (20.0)	7 (23.3)	13 (43.3)	4 (13.3)	0 (0.0)
	z-value	NA	0.27	1.94	0.33	2.82**	1.94	0.0	1.07	1.40	NA
	Total	0 (0.0)	23 (38.3)	19 (31.7)	11 (18.3)	7 (11.7)	19 (31.7)	14 (23.3)	22 (36.7)	5 (8.3)	0 (0.0)
The packing of organic products looks less pleasing to the eye.	Ludhiana	4 (13.3)	6 (20.0)	7 (23.3)	13 (43.3)	0 (0.0)	5 (16.7)	2 (6.7)	15 (50.0)	1 (3.3)	7 (23.3)
	Patiala	2 (6.7)	9 (30.0)	9 (30.0)	6 (20.0)	4 (13.3)	2 (6.7)	2 (6.7)	20 (66.7)	6 (20.0)	0 (0.0)
	z-value	0.44	0.89	0.58	1.94	0.21	1.21	0.0	1.31	2.01*	2.82**
	Total	6 (3.3)	15 (25.0)	16 (26.7)	19 (31.7)	4 (13.3)	7 (11.7)	4 (6.7)	35 (58.3)	7 (11.7)	7 (11.7)
Organics are supreme products consumed only by rich people.	Ludhiana	0 (0.0)	9 (30.0)	10 (33.3)	5 (16.7)	6 (20.0)	0 (0.0)	4 (13.3)	15 (50.0)	1 (3.3)	10 (33.3)
	Patiala	1 (3.3)	9 (30.0)	12 (40.0)	5 (16.7)	3 (10.0)	2 (6.7)	1 (3.3)	15 (50.0)	12 (40.0)	0 (0.0)
	z-value	0.22	0	0.54	0.0	1.08	1.44	1.40	0.0	3.45**	3.46**
	Total	1 (1.7)	18 (30.0)	22 (36.7)	10 (16.7)	9 (15.0)	2 (3.3)	5 (8.3)	30 (50.0)	13 (21.7)	10 (16.7)
There is small variety of organic products.	Ludhiana	0 (0.0)	12 (40.0)	8 (26.7)	3 (10.0)	7 (23.3)	6 (20.0)	9 (30.0)	5 (16.7)	7 (23.3)	3 (10.0)
	Patiala	0 (0.0)	13 (43.3)	8 (26.7)	7 (23.3)	2 (6.7)	4 (13.3)	10 (33.3)	15 (50.0)	1 (3.3)	0 (0.0)
	z-value	NA	0.26	0	1.39	1.81	0.69	0.28	2.74**	2.28*	1.78
	Total	0 (0.0)	25 (41.7)	16 (26.7)	10 (16.7)	9 (15.0)	10 (16.7)	19 (31.7)	20 (33.3)	8 (13.3)	3 (5.0)
There are a lot of sales points for organic products.	Ludhiana	0 (0.0)	13 (43.3)	6 (20.0)	6 (20.0)	5 (16.7)	2 (6.7)	2 (6.7)	12 (40.0)	11 (36.7)	3 (10.0)
	Patiala	1 (3.3)	10 (33.3)	15 (50.0)	3 (10.0)	1 (3.3)	0 (0.0)	9 (30.0)	14 (46.7)	7 (23.3)	0 (0.0)
	z-value	1.01	0.80	2.44*	1.08	1.72	1.44	2.34*	0.52	1.13	1.78
	Total	1 (1.7)	23 (38.3)	21 (35.0)	9 (15.0)	6 (10.0)	2 (3.3)	11 (18.3)	26 (43.3)	18 (30.0)	3 (5.0)
It is difficult to identify real organic products.	Ludhiana	0 (0.0)	7 (23.3)	11 (36.7)	5 (16.7)	7 (23.30	14 (46.7)	8 (26.7)	6 (20.0)	2 (6.7)	0 (0.0)
	Patiala	1 (3.3)	14 (46.7)	8 (26.7)	6 (20.0)	1 (3.3)	5 (16.7)	7 (23.3)	14 (46.7)	4 (13.3)	0 (0.0)
	z-value	1.01	1.89	0.83	0.33	2.28*	2.50*	0.30	2.19*	0.86	NA
	Total	1 (1.7)	21 (35.0)	19 (31.7)	11 (18.3)	8 (13.3)	19 (31.7)	15 (25.0)	20 (33.3)	6 (10.0)	0 (0.0)
I trust organic products.	Ludhiana	0 (0.0)	17 (56.7)	5 (16.7)	3 (10.0)	5 (16.7)	5 (16.7)	10 (33.3)	14 (46.7)	1 (3.3)	0 (0.0)
	Patiala	2 (6.7)	13 (43.3)	11 (3.7)	4 (13.3)	0 (0.0)	7 (23.3)	10 (33.3)	12 (40.0)	1 (3.3)	0 (0.0)
	z-value	1.44	1.55	2.25*	0.42	2.34*	0.65	0.0	0.52	0.0	NA
	Total	2 (3.3)	28 (46.7)	18 (30.0)	7 (11.7)	5 (8.3)	12 (20.0)	20 (33.3)	26 (43.3)	2 (3.3)	0 (0.0)

Figures in parenthesis indicate percentage,
*Significant at 5% level,
** Significant at 1% level

It was found that subjects of MIG of both cities had no practice to use organic foods daily. However, among HIG subjects 26.7 and 16.7% of the respondents from Ludhiana and Patiala city respectively were using organic foods daily (Table 5). It can be concluded that with the increase in income, consumption of organic foods increases on daily basis which might be due to higher affordability of these products with the increase in income. It was found that purchase intention towards organic foods and the level of income had a positive but insignificant relationship [8]. On weekly basis consumption of organic foods was found to be higher (50%) among HIG subjects as compared to that among MIG (30%) subjects. Overall, rare consumption of organic foods was found to be higher among MIG subjects as compared to HIG subjects. When the practices regarding the methods of washing, cutting, and cooking of organic foods were compared with those of unconventional foods, they were found to be similar in all the subjects of both the cities. However, chopping of organic vegetables was found to be more convenient as compared to conventional vegetables by subjects of both the income groups from both the cities.

Knowledge, Attitude and Practice (KAP) Score

As shown in Table 6, there was no significant difference in the overall knowledge and attitude score of both MIG and HIG respondents. However, there was a statistically significant ($p \leq 0.05$) difference in the overall practice score of respondents belonging to MIG and HIG. Hence, it can be concluded that although the level of income does not affect the knowledge and attitude regarding organic foods, but as the income increases the practices regarding using organic foods do increase.

Table 5: Practices towards organic foods among middle and high income group-subjects of selected cities (N=120)

Practices		MIG				HIG			
Ludhiana		Patiala	z-value	Total	Ludhiana	Patiala	z-value	Total	
Consumption of organic products		29 (96.7)	25 (83.3)	1.72	54 (90)	28 (93.3)	27 (90)	0.22	56 (93.3)
Frequency of using organic foods	Rarely	9 (30)	9 (30)	0.58	18 (30)	2 (6.7)	3 (10)	0.94	5 (8.3)
	Monthly	14 (50)	8 (26.7)	1.61	22 (36.7)	5 (16.7)	7 (23.3)	0.65	12 (20)
	Weekly	5 (16.7)	13 (43.3)	0.00	18 (30)	15 (50)	15 (50)	0.24	30 (50)
	Daily	0 (0.0)	0 (0.0)	NA	2 (3.3)	8 (26.7)	5 (16.7)	0.94	13 (21.7)
Methods of washing vegetables		19 (63.3)	20 (66.7)	0.27	39 (65.0)	25 (83.3)	26 (86.7)	0.36	51 (85.0)
Before cutting									
After cutting		19 (63.3)	17 (56.7)	0.53	36 (60.0)	14 (46.7)	16 (53.3)	0.52	30 (50.0)
Dipping		2 (6.7)	3 (10.0)	0.47	5 (8.3)	8 (26.7)	14 (46.7)	1.61	22 (36.7)
Rinsing		2 (6.67)	3 (10.0)	0.47	5 (8.3)	10 (33.3)	10 (33.3)	0.00	20 (33.3)
Rubbing while washing		1 (3.3)	4 (13.3)	1.40	5 (8.3)	2 (6.7)	1 (3.3)	0.59	3 (5.0)
Chopping is easier		22 (73.3)	23 (76.7)	0.30	45 (75.0)	21 (70.0)	17 (56.7)	2.36*	45 (75.0)
Cooking practice vary for organic food products		6 (20.0)	0 (0.0)	2.58*	6 (10.0)	0 (0.0)	4 (13.3)	2.07*	4 (6.7)
Cooking takes same time		15 (50.0)	8 (26.7)	1.86	23 (38.30	12 (40.0)	18 (60.0)	1.55	30 (50.0)
Cooking Methods									
Open Pan		14 (46.7)	24 (80.0)	2.68*	38 (63.3)	23 (76.7)	12 (40.0)	2.88**	35 (58.3)
Pan with lid		12 (40.0)	2 (6.7)	3.05**	14 (23.3)	17 (56.7)	14 (46.7)	0.78	31 (51.7)
Pressure Cooking		21 (70.0)	12 (40.0)	2.34*	33 (55.0)	15 (50.0)	19 (63.3)	1.04	34 (56.7)

Figures in Parenthesis indicate percentage

* Significant at 5% level,

** Significant at 1% level

Table 6: Mean Knowledge, Attitude and Practice score in middle and high income group subjects of selected cities (N=120)

Parameters	MIG(n=60)	HIG(n=60)	z-value	Total (N=120)
Knowledge	4.6 ± 0.7	4.8 ± 0.6	0.55	4.7 ± 0.6
Attitude	5.0 ± 0.5	5.2 ± 0.4	0.48	5.1 ± 0.4
Practice	3.0 ± 0.5	3.8 ± 0.4	2.40*	3.4 ± 0.4
KAP score	12.6 ± 1.7	13.8 ± 1.3	1.23	13.2 ± 1.4

Values are Mean ± SD,

* Significant at 5% level, Ns-non significant

Table 7: Correlation coefficients (r) of KAP score with demographic factors

Correlation of with KAP score	Age	Education	Income
Knowledge	0.19*	0.23**	0.11NS
Attitude	0.07NS	0.08NS	0.12NS
Practice	0.09NS	0.09NS	0.18*
KAP score	0.12NS	0.11NS	0.10NS

*- Correlation is significant at the 0.05 level (2-tailed).

*- Correlation is significant at the 0.01 level (1-tailed).

NS- Non-significant

Correlations between various factors and purchase of organic foods

In different states of India food consumption varies and the factors which influence consumption are regional, cultural, ethnic, income and difference in agricultural production. In the present study, correlation coefficient values of KAP scores with demographic factors like age, education and income were calculated and are represented in the Table 7.

The knowledge of the respondents had a significantly ($p \leq 0.05$) positive correlation with age and education, indicating that the knowledge increases with age and education, whereas it had a positive but non- significant correlation with income. The attitude of the respondents had a positive but non-significant correlation with age, education and income. Similarly, the practice score had a positive but non-significant correlation with age and education. However, it had a significantly ($p \leq 0.05$) positive correlation with the income.

Conclusion

Consumption of organic foods is increasing because of environmental and health issues. From the present study, it can be concluded that the knowledge and attitude of the consumers regarding organic foods is influenced by their education level and age as well. Furthermore, the level of income does not affect their knowledge and attitude regarding organic foods, but it does affect practice of using the same. The data can help both marketers and policy makers in formulating strategies and policies regarding the supply and availability of organic foods.

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Impact of Nutrition Counseling on Dietary Intake of Obese Women from Low, Middle and High Income Group of Hoshiarpur City of Punjab

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Abstract

A study was conducted to assess the impact of nutrition counseling on food consumption pattern of obese women from low, middle and high income group. To study the prevalence of obesity, 150 women in the age group of 40-50 years, belonging to low (LIG), middle (MIG) and high (HIG) income group (50 from each income group) were randomly selected from sub-mountainous region of Hoshiarpur city. Twenty five normal (BMI 20-22.9 kg/m^2) and 25 obese (BMI ≥ 27.5 kg/m^2) women from each income group were selected. Nutrition counseling was imparted to the subjects for 3 months. Its impact was assessed in terms of their dietary intake and gain in knowledge. Prevalence of overweight and obesity was higher in women belonging to HIG (70.7%) followed by MIG (67.3%) and LIG (56.6%). Percent adequacy of food groups like fats & oils, cereals, milk & milk products, roots and tubers and fruits was significantly ($p < 0.01$) higher in obese subjects as compared to normal subjects. Nutrition counseling of the obese subjects resulted in a gain in their knowledge and quantum of improvement, which further led to a decrease in the intake of fats & oils, cereals, milk & milk products, and roots & tubers by the obese subjects, compared to their consumption before the intervention and compared to women who only received routine counseling.

Keywords: Obesity; BMI; Income groups; Nutrition counseling.

Introduction

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have a negative effect on health, leading to reduced life expectancy and/or increased health problems. It can be seen as the first wave of a defined cluster of non-communicable diseases called "New World Syndrome," creating an enormous socio-economic and public health burden in poorer countries. It has become serious epidemic health problem, estimated to be the fifth leading cause of mortality at global level [1]. The World Health Organization has described obesity as one of the most neglected public health problem, affecting every region of the globe.

Increasing evidence of overweight/obesity indicates that India is experiencing a double burden of communicable and non-communicable diseases. In 2005, nearly 14% of women aged 18 to 49 were overweight or obese, with higher rates among urban women (25%) than rural women (8%) [2]. The rate of overweight and obesity in women, overall increased by 3.5% a year from 1998 to 2005. Comparison of two major studies conducted by National Family Health Survey (NFHS- 2 in 1998-1999 and NFHS-

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3 in 2005-2006 showed that prevalence of obesity among Indian women has elevated from 10.6 to 12.6 per cent (increased by 24.52%). The prevalence is found more in women of age between 40-49 yrs (23.7%), residing in cities (23.5%) and households in the highest wealth quantile (30.5%). Highest percentage of obese women (29.9%) was found in Punjab followed by Kerala (28%) and Delhi (26%), all of which are relatively richer states [3]. Therefore, the increasing trend of obesity among Indians is becoming a matter of concern.

Worldwide debates are continuing about using ethnic- specific or standard methods of assessment of obesity. The most common measure of overweight and obesity is the Body Mass Index (BMI), which is determined by the individual's weight and height. When a BMI value is over 25 kg/m^2, the value indicates an overweight. People are considered obese when their Body Mass Index (BMI) exceeds 30 kg/m^2 [4].

One of the major causes of obesity is the changes in the diet in terms of quantity and quality which has become more "westernized" and sedentary life styles [5]. To effectively cure obesity with diet management, controlling the excessive nutrient intake but also concretely instructing the know how of choosing right foods and desirable eating pattern are necessary [6]. Nutrition education/ counseling is therefore needed to motivate and create public awareness to preserve healthy life styles and adopt healthy dietary habits to reduce risk factors of obesity.

Nutrition counseling is one of the most effective tools of changing the food habits of the people without affecting their sentiments. It is a process by which the beliefs, attitude, environmental influents and knowledge about food and health are canalized into actual practices [7]. To maintain the reduced body weight after weight control, it is necessary to correct the way or pattern of eating, exercise and overall lifestyle [8]. Also it is important to acquire the ability to control one's own dietary habit by continuous nutrition education and counseling. Keeping these facts inview, the present community based study was carriedout in Hoshiarpur city, Punjab to assess the impact of nutrition counseling on food and nutrient intake of obese women of low, middle and high income groups.

Materials and Methods

Selection of subjects

A total of 150 women in the age group 40-50 years (50 belonging to each income group *i.e.* low income group, middle income group and high income group were selected randomly among the localities of Hoshiarpur city to study the prevalence of obesity. The Body Mass Index (BMI) was used as a criterion for the assessment of prevalence of obesity. According to the WHO classification for Asian population the women having BMI more than 27.5 are considered as obese [4]. Based on the BMI, further 50 subjects from each income group were selected into two categories: normal and obese (25 subjects in each category), thus making a total sample size of 150 subjects.

An interview schedule was drafted to obtain the desired information on various aspects such as general information, family history, dietary intake, etc. of the subjects. Pretesting was carried out on 15 subjects to test the reliability and validity of questionnaire and the necessary modifications were made. Pretested subjects were not included in the study.

Background Information

Information about the subjects pertaining to age, educational qualification, monthly income, marital status, family type, family size, nature of work, lifestyle related information, medical history and usage of drugs was recorded through a pre-structured tested questionnaire was collected.

Dietary assessment

Information regarding the intake of food for three consecutive days was collected from the subjects using 24-hour recall method. Mean daily intake of different food groups including cereals, pulses, fruits, green leafy vegetables, roots and tubers, other vegetables, milk and milk products, sugar and jaggery and fats and oils was calculated by taking mean intake of three consecutive days. Cooked food consumed was converted into their raw equivalents. Different food items were converted into their raw equivalents and the average daily intake of energy, proximate principles, important vitamins and minerals were calculated by Dietcal a computer software [9].

Assessment of knowledge

A multiple choice questionnaire was also designed to test the nutrition knowledge of the subjects. After pre-testing the knowledge of the respondent's nutrition education in the form of lectures, trainings, talks, group discussions etc. was imparted to 150 subjects for a period of three months. Full package of knowledge through pamphlet and

booklet on Obesity were also given to the subjects. For evaluating questionnaire 1 score was awarded for each correct and zero for wrong answer. Post nutrition knowledge test was conducted after three months to note the gain in score and quantum of improvements in the diet. Gain in knowledge was calculated using the following equation.

Gain in knowledge = Score of post test – Score of pre test

Quantum of Improvement= Post test scores/ Pre test scores

Statistical analysis

The data on all the parameters viz. food intake, nutrient intake and gain in knowledge were analyzed statistically with the help of mean, standard error, percentage and paired-'t'test.

Results and Discussion

Dietary Intake

It was observed (Table 1) that majority of the obese subjects *i.e.* 24, 68 and 52 percent were vegetarians whereas 48, 20 and 16 percent were non- vegetarians in LIG, MIG and HIG, respectively. However, corresponding values for ovatarians in all the three income groups were 28, 12 and 32 percent, respectively.

The daily consumption pattern of fruits and salads in the normal category showed that among the LIG (60%) and MIG (40%) consumed twice a week whereas HIG (40%) consumed daily. In the obese category LIG (72%), MIG (52%) and HIG (68%) consumed thrice a week. As evident from the Table 1 majority of the obese subjects *i.e.* 92, 100 and 88 percent in LIG, MIG and HIG, respectively preferred to have food from outside. The data clearly indicated that the frequency of

Table 1: Dietary Habits of the selected subjects.

Parameters	LIG (n=50)		MIG (n=50)		HIG (n=50)	
	Normal (n=25)	Obese (n=25)	Normal (n=25)	Obese (n=25)	Normal (n=25)	Obese (n=25)
Dietary Pattern						
Vegetarian	15 (60)	6 (24)	11 (44)	17 (68)	8 (32)	13 (52)
Non-vegetarian	7 (28)	12 (48)	9 (36)	5 (20)	8 (32)	4 (16)
Ovatarian	3 (12)	7 (28)	5 (20)	3 (12)	9 (36)	8 (32)
No. of meals per day						
Twice	1 (4)	-	-	-	-	-
Thrice	24 (96)	22 (88)	16 (64)	1 (4)	7 (28)	1 (4)
Four times	-	3 (12)	9 (36)	9 (36)	17 (68)	9 (36)
More than four times	-	-	-	15 (60)	1 (4)	15 (60)
Fruits and salad consumption						
Daily	7 (28)	4 (16)	7 (28)	12 (48)	10 (40)	3 (12)
Twice a week	15 (60)	3 (12)	10 (40)	-	9 (36)	5 (20)
Thrice a week	3 (12)	18 (72)	8 (32)	13 (52)	6 (24)	17 (68)
Outside food consumption						
Yes	9 (36)	23 (92)	17 (68)	25 (100)	20 (80)	22 (88)
No	16 (64)	2 (8)	8 (32)	-	5 (20)	3 (12)
Outside food consumption pattern						
Once a week	4 (16)	8 (32)	4 (16)	7 (28)	5 (20)	3 (12)
Twice a week	-	4 (16)	2 (8)	13 (52)	3 (12)	14 (56)
Thrice a week	1 (4)	-	2 (8)	4 (16)		3 (12)
Fortnightly	4 (16)	9 (36)	9 (36)	1 (4)	12 (48)	2 (8)
Daily	-	3(12)	-	-	-	-
Rarely	16 (64)	1 (4)	8 (32)	-	5 (20)	3 (12)

LIG-Low income group, MIG- Middle income group and HIG- High income group

Figures in parenthesis indicate percentage.

food consumption from outside was more in obese subjects belonging to all the three income groups, which might be a major contributor to obesity.

Consumption pattern of various food items

The data regarding food frequency (Table 2) indicated that consumption of fried foods and snacks was significantly higher in obese subjects of all the three income groups, whereas a non-significant difference was observed in the frequency score of carbonated beverages, sweet dishes and bakery products.

Food intake

Mean daily food intakeby normal and obese subjects of all the income groups and their comparison with suggested dietary intake [10] are given in Table 3. Mean daily intakes of energy yielding foods suchas cereals, roots and tubers, fats and oils and milk and milk products were significantly higher by obese subjects of all the three income groups as compared tonormal subjects. The percent adequacy of all the food groups by LIG group was below the suggested intakes. Among MIG, the intake of fruits (115.8 and 115.0%), milk and milk products (130.1 and 137.8%) and fats and oils (100.6 and 212.9%) was found to be adequate by normal and obese subjects respectively. The percent adequacy of pulses was 144.2% and 166.0% by normal and obese subjects of HIG. The consumption of pulses increased with increase in income level. It was also reported that obese women consumed significantly higher ($p \leq 0.05$) quantities of pulses than normal women [11]. Consumption of roots and tubers was higher in the obese subjects in all the three income groups *i.e.* 199.8 ± 58.0, 185.4 ± 66.6 and 156.2 ± 30.8g as compared to the normal subjects *i.e.* 145.9 ± 53.8, 146.2 ± 41.1 and 120.4 ± 40.1g in MIG, HIG and LIG, respectively.

It was observed that fruit intake was significantly higher in normal as well as obese subjects belonging to MIG and HIG as compared to that in the LIG. The consumption of milk and milk products was significantly different among the normal and the obese subjects in all the income groups. The LIG usually consume milk in the form of tea and very few were habitual of drinking milk. However, MIG and HIG subjects consumed milk in the form of paneer, cheese, flavoured milk, tea, sweets etc. Kaur (1995) [12] also reported less milk consumption among LIG (325g) as compared to MIG (658g) and HIG (863g). High intake of milk and its products in obese were also reported in literature [13]. The results (Table 3) showed that average daily intake of fats and oils was significantly ($p \leq 0.05$) higher among the obese subjects as compared to the normal subjects with high intake of 64.4 ± 13.1 g by HIG obese subjects in comparison to 49.4 ± 16.2 g by the normal subjects. The percent adequacy for fats and oils in normal subjects belonging to LIG, MIG and HIG was 28.8, 100.6 and 247 percent whereas in the obese subjects it was 41.2, 212.9 and 322 percent, respectively. The higher intake of fats and oils was mainly because of the more consumption of fried food among the three groups. It was also reported in the literature that more than 100 percent adequacy of fats and oil among LIG, MIG and HIG and consumption of higher amount of fat among the HIG (67g) as compared to MIG (58g) and LIG (56g) [14].

Nutrient intake

The mean daily intake of nutrients by the selected subjects is shown in Table 4. The percent adequacy among normal subjects was found out to be 42.5%, 73.6% and 103.3% whereas in obese subjects it

Table 2: Frequency food scores of various food items.

Parameters	LIG (n=50)			MIG (n=50)			HIG (n=50)		
	Normal (n=25)	Obese (n=25)	t value	Normal (n=25)	Obese (n=25)	t value	Normal (n=25)	Obese (n=25)	t value
Fried foods	2.3 ± 1.4	3.8 ± 0.7	4.63*	3.4 ± 1.4	3.2 ± 0.8	2.63**	3.5 ± 0.8	3.9 ± 1.2	2.80**
Snacks	2.8 ± 1.5	3.6 ± 0.8	2.24**	3.6 ± 1.1	4.6 ± 0.5	3.9*	3.5 ± 0.7	4.7 ± 0.5	6.65*
Carbonated beverages	1.2 ± 0.8	1.4 ± 1.0	0.428^{NS}	1.9 ± 1.1	2.2 ± 1.0	0.76^{NS}	2.3 ± 1.3	2.7 ± 1.4	0.92^{NS}
Sweet dishes	2.6 ± 1.3	3.1 ± 1.6	1.12^{NS}	3.2 ± 1.6	3.6 ± 1.8	0.82^{NS}	3.7 ± 1.0	3.9 ± 1.5	0.426^{NS}
Bakery products	0.2 ± 0.4	0.7 ± 0.7	2.65**	1.3 ± 1.1	1.5 ± 1.1	0.73^{NS}	2.2 ± 0.9	2.4 ± 1.1	0.66^{NS}

LIG-Low income group, MIG- Middle income group, HIG- High income group

Values are Mean ± SD Mean scores (0, 1,2,3,4,5,6)

* Significant at 1%

** Significant at 5% ^{NS}- Non significant

was 58.5%, 106.3% and 120.7% belonging to LIG, MIG and HIG respectively when compared with RDA [10]. A higher intake of energy in MIG and HIG subjects might be due to higher consumption of fats and oils and also sugar among them. A similar view has also been reported that a higher intake of energy by the obese respondents than their respective RDA [15,16]. Low intake of energy by LIG as compared to MIG and HIG was also reported in the literature [12].

Except fats, Dietary fiber, calcium and vitamin A the consumption of all other nutrients was significantly different among the normal and the obese subjects in all the income groups. In LIG, the percent adequacy for fat was 100.5 and 114.6 percent

Table 3: Daily food intake of the selected subjects

Food groups (g/day)	# Suggested Dietary intake	LIG (n=50)			MIG (n=50)			HIG (n=50)		
		Normal (25)	Obese (25)	t value	Normal (25)	Obese (25)	t value	Normal (25)	Obese (25)	t value
Cereals	270	122.0 ± 30.6	207.2 ± 48.4	7.43*	172.0 ± 32.8	230.8 ± 53.8	4.65*	185.4 ± 39.6	241.1 ± 66.2	3.60*
Pulses and Legumes	55	19.8 ± 8.4	19.6 ± 8.6	0.08^{NS}	46.6 ± 17.5	48.6 ± 33.9	0.48^{NS}	79.3 ± 24.0	82.2 ± 31.3	0.36^{NS}
Green leafy Vegetable	100	2.4 ± 6.2	3.3 ± 6.7	0.50*	4.0 ± 7.0	6.9 ± 19.9	0.69^{NS}	8.6 ± 13.6	8.4 ± 20.7	0.053^{NS}
Roots and Tubers	200	120.4 ± 40.1	156.2 ± 30.8	3.53*	145.9 ± 53.8	199.8 ± 58.0	3.40*	146.2 ± 41.1	185.4 ± 66.6	2.50*
Other vegetable	200	24.5 ± 14.0	28.0 ± 11.6	0.96^{NS}	38.4 ± 26.0	39.7 ± 47.8	1.34^{NS}	41.8 ± 18.5	43.3 ± 38.4	1.75^{NS}
Fruits	100	18.5 ± 21.9	17.2 ± 18.2	0.23^{NS}	115.6 ± 98.4	115.0 ± 94.6	1.53^{NS}	192.2 ± 87.2	193.6 ± 109.8	0.049^{NS}
Milk and milk Products	300	149.6 ± 50.0	175.4 ± 65.0	3.56*	390.2 ± 136.2	413.4 ± 128.4	3.62*	490.9 ± 133.8	542.5 ± 154.7	4.26*
Sugar	20	9.5 ± 6.1	10.0 ± 7.0	0.22^{NS}	14.3 ± 7.9	12.5 ± 12.1	0.63^{NS}	24.1 ± 11.2	18.2 ± 20.2	1.28^{NS}
Fats and Oils	20	5.7 ± 2.5	8.2 ± 3.8	2.68**	20.1 ± 10.0	42.5 ± 15.2	6.12*	49.4 ± 16.2	64.4 ± 13.1	2.29**
Meat and Poultry		19.0 ± 36.2	23.4 ± 28.9	0.47^{NS}	15.0 ± 31.5	21.7 ± 46.5	0.59^{NS}	34.0 ± 72.7	37.6 ± 61.6	0.188^{NS}

LIG-Low income group, MIG-Middle income group, HIG- High income group

* Significant at 1%

** Significant at 5% ^{NS}-Non significant

ICMR (2010)

Table 4: Daily nutrient intakes of selected subjects

Nutrients	#RDA	LIG (n=50)			MIG (n=50)			HIG (n=50)		
		Normal (n=25)	Obese (n=25)	t-value	Normal (n=25)	Obese (n=25)	t-value	Normal (n=25)	Obese (n=25)	t-value
Energy (Kcal)	1900	807 ± 94.4	1111 ± 210.0	6.61*	1399 ± 235.6	2020 ± 267.2	8.71*	1963 ± 405.3	2295 ± 323.8	3.19*
Protein (g)	55	28.9 ±4.8	39.7 ± 7.7	5.93*	45.5 ±9.0	64.4 ± 10.9	6.67*	58.9 ± 13.4	71.9 ± 11.4	3.69*
Fat (g)	20	20.1 ± 7.6	22.9 ± 5.2	1.52^{NS}	46.1 ± 4.6	56.1 ± 19.6	1.05^{NS}	85.5 ± 21.3	95.0 ± 20.8	1.60^{NS}
Carbohydrates (g)	-	120.8 ± 23.7	185.4 ± 41.3	6.76*	184.3 ± 33.4	250.2 ± 36.8	6.62*	217.9 ±46.2	264.5 ± 53.6	3.29*
Total dietary fiber (g)	-	7.4 ± 2.5	7.4 ± 2.7	0.06^{NS}	10.3 ± 3.7	13.4 ± 4.6	1.94^{NS}	15.5 ± 3.3	16.6 ± 6.3	0.72^{NS}
Calcium (mg)	600	437.4 ± 112.7	441.4 ± 94.3	0.136^{NS}	892.6 ± 263.6	982.1 ± 292.7	1.67^{NS}	1198.9 ± 344.3	1344.2 ± 310.4	1.56^{NS}
Iron (mg)	21	7.9 ± 1.4	12.0 ± 2.8	6.46*	11.7 ±2.4	17.8 ± 4.2	6.14*	14.4 ± 2.4	18.8 ± 4.9	4.03*
Vitamin A (µg)	600	182.0 ± 164.6	171.6 ± 126.4	0.24^{NS}	259.2 ± 172.7	351.7 ± 229.5	1.60^{NS}	470.6 ± 330.1	587.9 ± 580.7	0.87^{NS}
Thiamin (mg)	1.0	0.8 ± 0.1	1.2 ± 0.2	7.32*	1.1 ± 0.2	1.6 ± 0.3	6.36*	1.4 ± 0.2	1.7 ± 0.4	3.72*
Riboflavin (mg)	1.1	0.4 ± 0.1	0.7 ± 0.2	5.96*	0.7 ±0.1	1.0 ± 0.3	4.17*	1.0 ± 0.3	1.2 ± 0.3	2.19**
Niacin (mg)	12	6.1 ± 1.3	10.2 ± 2.5	6.99*	8.0 ± 2.2	11.6 ± 2.8	4.94*	8.8 ± 2.0	12.0 ± 3.5	3.91*
Folic acid (µg)	200	102.2 ± 26.6	140.4 ± 32.3	4.56*	142.0 ± 40.3	204.0 ± 63.7	4.11*	198.7 ± 56.4	235.2 ± 66.2	3.04*
Vitamin C (mg)	40	30.2 ± 9.8	36.4 ± 9.7	2.22**	69.8 ± 35.6	98.0 ±38.0	2.70**	103.6 ± 34.5	119.6 ± 90.3	2.42**

LIG-Low income group, MIG-Middle income group, HIG- High income group,

ICMR (2010)

* Significant at 1%

** Significant at 5% ^{NS} -Non significant

for normal and obese subjects, all other nutrients were inadequately consumed except thiamin in obese subjects. The obese subjects of MIG and normal subjects of HIG were consuming all the nutrients adequately except iron, riboflavin, niacin and folic acid whereas the obese subjects of HIG were having all the nutrients in adequate amounts as compared to RDA. The percent adequacy was found out to be 100.5%, 230.9% and 427.5% by the normal subjects of LIG, MIG and HIG whereas for the obese subjects it was reported as 114.6, 280.85 and 475.45 percent, respectively. This excessive consumption of fat among Punjabi women has also been reported in the literature [17,18]. The high intakeof fat in all the three groups might be due to strong liking and a higher consumption of fried and fast foods. In a previous study, it was that dietary fat promotes more obesity than carbohydrate or protein of same energy value [19]. Similar results have been reported in the literature [20,21,16].

The consumption of vitamins namely thiamine, riboflavin, niacin, folic acid and vitamin C differ significantly among the normal and the obese subjects while vitamin A did not differ significantly among the normal and the obese subjects of the three income groups. The results clearly indicated that the obese subjects consumed large meals resulting in high intakes of energy, protein, carbohydrates and fat but on the other hand, the large meals also provided them with more vitamins which have positive effect on their overall health.

Nutrition Counseling

Nutrition counseling regarding obesity, its causes, consequences, control and prevention, balanced diet, dietary recommendations, cooking practices and ill effects of junk foods was imparted to the subjects for a period of three months. The evaluation of scores was done before (pre-test) and after (post-test) nutrition counseling to assess the difference in nutrition knowledge among normal and obese subjects. The average gain in knowledge during nutrition counseling is presented in Table 5. Quantum of improvement in normal and obese subjects of HIG was (1.2 ± 2.1 and 1.1 ± 1.3 respectively), whereas in MIG it was (1.2 ± 1.2 and 1.4 ± 2.0 respectively) followed by LIG normal and obese subjects (1.3 ± 2.1 and 1.5 ± 2.0 respectively) depicting a significant difference among the quantum of improvement of the subjects in all the three income groups.

Table: 5: Gain in scores before and after nutrition counseling

Groups	LIG (n=50)			MIG (n=50)			HIG (n=50)		
	Normal (n=25)	Obese (n=25)	t value	Normal (n=25)	Obese (n=25)	t value	Normal (n=25)	Obese (n=25)	t value
Pre Test	19.1 ± 2.4	17.6 ± 2.7	1.99^{NS}	21.3 ± 2.3	22.1 ± 2.6	1.14^{NS}	21.9 ± 2.4	23.4 ± 2.1	2.28**
Post Test	25.2 ± 1.9	25.6 ± 1.1	0.98^{NS}	26.1 ± 2.1	26.8 ± 1.3	1.34^{NS}	25.7 ± 2.0	26.1 ± 1.4	0.78^{NS}
t- Value	9.80*	13.22*		7.67*	8.01*		5.96*	5.21*	
Gain	6.0 ± 2.0	8.0 ± 2.0	3.21*	4.8 ± 2.2	4.9 ± 2.0	2.19**	3.8 ± 2.1	2.7 ± 1.3	2.12**
Quantum of improvement	1.3 ± 0.1	1.4 ± 0.2	2.95*	1.2 ± 0.1	1.4 ± 0.1	2.19**	1.1 ± 0.1	1.1 ± 0.0	2.15**

LIG-Low income group, MIG-Middle income group, HIG- High income group ^{NS} -Non significant * Significant at 1% ** Significant at 5%

Table 6: Food intake of the subjects before and after nutrition counseling.

Food groups (g/d)	LIG (n=25)			MIG (n=25)			HIG (n=25)		
	Before	After	t value	Before	After	t value	Before	After	t value
Cereals	207.2 ± 48.4	200.8 ± 44.4	2.24**	230.8 ± 53.8	227.2 ± 51.8	2.45**	241.1 ± 66.2	236.4 ± 65.2	2.41**
Pulses and Legumes	19.6 ± 8.6	17.2 ± 6.6	1.56^{NS}	48.6 ± 33.9	42.9 ± 30.9	1.89^{NS}	82.2 ± 31.3	78.2 ± 30.3	1.78^{NS}
Green leafy vegetable	3.3 ± 6.7	3.8 ± 6.7	1.67^{NS}	6.0 ± 19.9	6.9 ± 18.5	1.76^{NS}	8.4 ± 20.7	7.9 ± 19.7	1.43^{NS}
Roots and Tubers	156.2 ± 30.8	152.5 ± 28.8	1.2 ^{NS}	199.8 ± 58.0	194.8 ± 54.0	1.87^{NS}	185.4 ± 66.6	180.4 ± 66.6	1.14^{NS}
Other vegetable	28.0 ± 11.6	26.0 ± 10.3	1.48^{NS}	39.7 ± 47.8	36.7 ± 47.6	1.64^{NS}	43.3 ± 38.4	40.5 ± 36.2	1.52^{NS}
Fruits	17.2 ± 18.2	19.6 ± 15.4	1.89^{NS}	115.0 ± 94.6	118.0 ± 93.6	1.56^{NS}	193.6 ± 109.8	195.9 ± 108.8	1.84^{NS}
Milk and Milk Products	175.4 ± 65.0	170.3 ± 62.0	2.33**	413.4 ± 128.4	409.6± 125.4	2.76**	542.5 ± 154.7	539.5 ± 153.7	2.84**
Sugar	10.0 ± 7.0	9.0 ± 6.5	1.91^{NS}	12.5 ± 12.1	11.5 ± 10.1	1.76^{NS}	18.2 ± 20.0	16.2 ± 18.0	1.54^{NS}
Fats and Oils	8.2 ± 3.8	7.0 ± 2.5	2.87**	42.5 ± 15.2	40.5 ± 12.2	2.75**	64.4 ± 13.1	62.3 ± 13.1	2.69**
Meat and Poultry	23.4 ± 28.9	21.2 ± 26.9	2.22**	21.7 ± 46.5	19.6 ± 44.5	2.40**	37.6 ± 61.6	36.8 ± 61.6	2.37**

LIG-Low income group, MIG-Middle income group, HIG- High income group ^{NS} -Non significant * Significant at 1% ** Significant at 5%

Table 7: Nutrient intake of the subjects before and after nutrition counseling.

Nutrients	LIG (n=25)			MIG (n=25)			HIG (n=25)		
	Before	After	t value	Before	After	t value	Before	After	t value
Energy (Kcal)	1111 ± 210.0	1100 ± 208.0	2.87**	2020 ± 267.2	2017 ± 267.2	2.76**	2295 ± 323.8	2289 ± 323.8	2.54**
Protein (g)	39.7 ± 7.7	38.7 ± 7.7	1.43^{NS}	64.4 ± 10.9	63.7 ± 10.9	1.11^{NS}	71.9 ± 11.4	70.9 ± 11.4	0.68^{NS}
Fat (g)	22.9 ± 5.2	20.3 ± 5.2	2.88**	56.1 ± 19.6	54.6 ± 19.6	2.75**	95.0 ± 20.8	89.0 ± 20.8	2.45**
Carbohydrates (g)	185.4 ± 41.3	180.2 ± 41.3	2.44**	250.2 ± 36.8	248.5 ± 36.8	2.31**	264.5 ± 53.6	260.5 ± 53.6	2.45**
Total dietary fibre (g)	7.4 ± 2.7	7.4 ± 2.7	1.10^{NS}	13.4 ± 4.6	13.4 ± 4.6	1.45^{NS}	16.6 ± 6.3	16.6 ± 6.3	1.87^{NS}
Calcium (mg)	441.4 ± 94.3	436.4 ±94.3	2.30**	982.1 ± 292.7	980.4 ± 292.7	2.67**	1344.2 ±310.4	1342.5 ± 310.4	2.73**
Iron (mg)	12.0 ± 2.8	11.7 ± 2.8	1.89^{NS}	17.8 ± 4.2	16.4 ± 4.2	1.54^{NS}	18.8 ± 4.9	16.8 ± 4.9	1.73^{NS}
Vitamin A (µg)	171.6 ± 126.4	167.8 ± 126.4	1.93^{NS}	351.7 ± 229.5	348.5 ± 229.5	1.59^{NS}	587.9 ±580.7	580.3 ± 580.7	1.54^{NS}
Thiamin (mg)	1.2 ± 0.2	1.1 ± 0.2	0.98^{NS}	1.6 ± 0.3	1.5 ± 0.3	0.69^{NS}	1.7 ± 0.4	1.6 ± 0.4	0.56^{NS}
Niacin (mg)	10.2 ± 2.5	9.8 ± 2.5	1.12^{NS}	11.6 ± 2.8	11.0 ± 2.8	1.43^{NS}	12.0 ± 3.5	11.0 ± 3.5	1.76^{NS}
Folic acid (µg)	140.4 ± 32.3	139.1 ± 32.3	0.46^{NS}	204.0 ± 63.7	203.0 ± 63.7	0.51^{NS}	235.2 ± 66.2	233.4 ± 66.2	0.64^{NS}
Vitamin C (mg)	36.4 ± 9.7	34.4 ± 9.7	2.10**	98.0 ±38.0	96.0 ± 38.0	2.44**	119.6 ± 90.3	117.6 ± 90.3	2.28**

LIG-Low income group, MIG-Middle income group, HIG- High income group

^{NS}-Non significant * Significant at 1% ** Significant at 5%

A significant (p≤0.01) difference was found between the pre and post test scores of the subjects in all the income groups. Hence it can be concluded that there was gain in knowledge of the subjects after the nutrition counseling.

The data revealed that there was a significant (p≤0.05) decrease in the intake of cereals, milk and milk products, fats and oils and meat and poultry in the subjects after nutrition counseling whereas the intake of pulses and legumes, green leafy vegetables, other vegetables, roots and tubers, fruits and sugar showed a non-significant change (Table 6).

The data revealed that after counseling there was a significant (p≤0.05) decrease in the intake of various nutrients viz. energy, fat, carbohydrate, calcium and vitamin C in the obese subjects whereas a non significant change was found in the intake of protein, total dietary fibre, iron, vitamin A, thiamine, riboflavin, niacin and folic acid by the subjects. Significant decrease was observed in carbohydrate intake after nutrition counseling in all the income groups and it was mainly due to avoidance of refined foods, sugar and jaggery and fast foods and also inclusion of high fiber fruits and vegetables, whole wheat flour, dalia etc. in their daily diets as explained during nutrition counseling. Similarly, a decrease in the percent adequacy of the nutrients was observed after nutrition counseling (Table 7). A significant decrease was found in the intake of milk and milk products and fats and oils which might be another contributory factor in lowering the energy, calcium and fat intake after nutrition counseling but total fat and milk intake was found still higher than the suggested intake in MIG and LIG groups. Others workers also reported significant reduction in fat intakes after nutrition counseling [7].

Conclusion

It may be concluded that the overall prevalence of overweight and obesity in the women of Hoshiarpur was found to be 56.6, 67.3 and 70.6 percent in low, middle and high income group respectively. Percent adequacy of food groups including roots and tubers, fruits, milk & milk products and fats & oils was higher in obese subjects as compared to their normal counterparts in all the three income groups. Nutrition counseling of the subjects resulted in a gain in their knowledge and quantum of improvement, which further led to a decrease in the intake of cereals, milk & milk products, fats & oils and roots and tubers which resulted in significant decrease in energy, fat, carbohydrates, calcium, and vitamin C values by the obese subjects as compared to normal subjects in all the three income groups. Among various nutrients fat and energy intake were found to be associated with the risk factors of obesity so there is a need to create awareness regarding the intake of low fat, low carbohydrate and high fiber diet among the masses. Imparting knowledge about the benefits of physical activity will furtherhelp in reducing the risk factorsof obesity. Therefore, it is recommended that physical activity is a prerequisite for controlling weight; hence activities like jogging, walking, exercise etc should become a part of daily routine.

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Review Article

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Vegetable Pigments: Effect of Ph and Heat- A Review

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Abstract

Commonly, vegetables are prepared at home on the basis of convenience and taste rather than nutrient losses. many studies have been conducted in the recent past to investigate the impact of cooking methods and Ph on the retention of pigments and stability of nutrients in coloured vegetables. The results of these studies vary widely leading the consumer to question the best method of preparing and cooking coloured vegetables, A literature search was conducted to identify studies that evaluated the effects of cooking techniques on the levels of Chlorophyll and carotenoids in vegetables The objective of this review is to evaluate the most recent studies and draw conclusions that will enable: (a) the consumer to identify the impact of cooking methods and Ph on the retention of pigments of coloured vegetables and (b) identify the critical phases during cooking, when colour and nutrients might be lost. The present study concentrated on chlorophyll and carotenoid pigments.

Keywords: Chlorophyll; Carotenoids; Cooking methods; Ph; Vegetables.

Introduction

The bright colors of many vegetables contribute a lot to their attractiveness. The colours result from the pigments contained in their tissues. The chief pigments of vegetables and fruits may be classified as water insoluble and water soluble [1].

Chlorophyll pigments are largely insoluble in water and dominant in unripe fruits. they're held close to the cytomembrane in tiny bodies referred to as chloroplasts. Chlorophyll-a is intense blue green in colour and chlorophyll-b is dull yellow green in colour. This pigment is present in green leafy vegetables, capsicum, beans, peas and chillies [2].

Carotenoids are widely distributed natural pigments accountable for the yellow, orange, and red colours of fruits and vegetables. Carotenoids are often divided into carotenes containing solely carbon and hydrogen, and xanthophylls made up of carbon, hydrogen, and oxygen [3]. Carotenoids owe their name to carrots (Daucus carota), and xanthophyll is derived from the Greek words for yellow and leaf. This pigment remains unaffected by heat or acidic medium however turns slightly blue in alkalescent medium. Thus, the colour of the vegetables and fruits containing carotene remains unchanged on cooking [4].

Report suggests that 5 to 78% of the β-carotene is degraded when vegetables are cooked by different domestic methods. Considerable quantities of carotenoids may also be lost during household cooking of vegetables [5]. Thus, information on the possible losses of carotenoids from vegetables, during traditional cooking methods is of major importance. There are documented evidence on

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loss of β-carotene after boiling, stewing, frying, blanching, and pressure cooking cooking.

Methods of cooking *[6]*

Boiling in water: This is one of the common methods used in homes. The vegetables are washed, cut, cooked in excess of water for 20-30 minutes and the excess of water is rejected. This leads to considerable loss of water soluble vitamins and minerals.

Steaming: The vegetables are washed and cut and placed in vessels containing small amounts of water and steamed in a cooker under ordinary pressure for 20-30 minutes. The losses of nutrients are minimal in this method of cooking.

Pressure cooking: The vegetables are washed and cut and placed in vessels containing small amounts of water and cooked in steam under pressure for 10-15 minutes. The losses of nutrients are similar to those occurring in steaming under atmospheric pressure.

During boiling and steaming, the cells expand suddenly, and gases escape from the spaces in between the cells. The heat damages chloroplasts hence releases natural cell acids to turn green pigments into olive-green. This change occurs in the first few seconds of cooking, and the air pockets change the color of the chloroplasts. when these molecules are collapsed by the sudden rush of heat on to the vegetable they become brighter.

B. Texture

Cooking in general affects the texture of all foodstuffs. The cellulose present in them becomes softer and this makes the foodstuffs also softer for example, cooked vegetables are much softer than raw. Cooking in an alkaline medium softens the cellulose much faster and gives the foodstuffs a mushy appearance whereas cooking in an acidic medium makes the texture hard and such foodstuffs have to be cooked for a longer period. The texture of the food, after cooking is also dependent on the method which is used for cooking [7]. Moist heat methods i.e. boiling, steaming, pressure cooking and stewing makes the foodstuffs soft and tender.

The objective of the present study was to determine the effect of different domestic cooking methods on chlorophyll and carotenoids retention in string beans (Phaseolus vulgaris, L.) and carrots (*Daucus carota* L.) the commonly consumed vegetables. chlorophyll and β-carotene were chosen for the present studies since they form the main pigments contributing to the health benefits of Vitamin A in human. The study was aimed to find the effect of culinary treatments like steaming boiling and prolonged cooking at different cooking durations (4 and 8 min) on the chlorophyll and carotenoid pigments of string beans (*Phaseolus vulgaris,* L.) and carrots (*Daucus carota* L.) in the first phase followed by change in ph of the cooking water in the second phase.

Sample preparation

Upon arrival at the department of Nutrition and Dietetics laboratory, the fresh vegetables were washed under tap water and excessive water dripped off. Edible portions (600 g) of the vegetables were separated and cut to small pieces, in edible parts were removed. The vegetables were divided into five portions with 100g for each application. One portion was retained raw and others were subjected to different cooking treatments by altering the Ph. The colour change, texture and doneness were observed. The variations were compared with control (uncooked).

Cooking Treatments

a. Boiling in open pan for 10 minutes followed by closing

b. Prolonged cooking

c. Steaming

d. Addition of vinegar (1 tsp)

e. Addition of alkali- Baking soda (1/2 tsp)

f. Control (uncooked).

Boiling

Vegetable (100g) was added to 250 ml of water that has just reached the boiling temperature in a stainless steel pot, cooked for 4 or 8 min, Samples were drained off and cooled rapidly.

Prolonged cooking

Vegetable (100 g) was added to 500 ml of water that has just reached the boiling temperature in a stainless steel pot, cooked for more than 10 minutes. Samples were drained off and cooled rapidly.

Steaming

Vegetable (100g) was placed on tray in a steam cooker covered with a lid and steamed over boiling water for 7-10 min under atmospheric pressure. The samples were rapidly cooled.

a. Green vegetable- Chlorophyll

All the variations were compared to the raw, cut vegetables.

Boiling of string beans in open pan for 10 minutes followed by closing resulted in bright green colour. The heat breaks down the cell structure in the pigment. This results in change of color. Cooking vegetables in an uncovered pan for few minutes helps to eliminate volatile acids and prevents formation of Pheophytin that results in formation of olive-green colour [8]. Boiling is more similar to the steaming but still had a brighter appearance compared to control (Fig. 1). Chlorophyll pigments are sensitive to heat and cooking. The magnesium atom present in the centre is easily replaced by hydrogen ions or other metal ions. As the cooking process continues (Prolonged cooking) the colour of the string beans changed from the bright green colour to the olive green. Excessive heating exposes the plants own acids to the chlorophyll which in turn makes the cooked product dull green [9]. Steaming turned string beans to a dark green colour. After few minutes the beans was a little bit darker and a more distinct green in colour compared to control.

In phase II when the PH was altered by addition of vinegar the colour of string beans turned almost immediately to a much lighter shade of green. After 5 minutes the color was considerably lighter. Magnesium present in the structure of chlorophyll is rather easily displaced by hydrogen molecule when heated in the presence of organic acids. A pale greenish grey compound known as Pheophytin-a or an olive-green Pheophytin-b results. Chlorophyll-a is more readily converted to pheophytin than chlorophyll-b [10]. when the PH was reduced to alkaline phase by adding baking soda there was not much immediate reactions After 5 minutes the colour was slightly darker than the control. The phytyl and methyl groups of chlorophyll are displaced and a bright green water-soluble sodium salt of chlorophyllin compound is formed.

b. Yellow-orange vegetable-carotenoids

The pigments that color these vegetables are deep orange colour called carotenoids. They are very stable pigments. All the variations were compared to the raw, peeled, carrots. Steaming resulted in darker and brighter orange colour of carrots. They appeared to have similar color to that of raw carrots. Boiling resulted in more yellow pigments than the raw carrots. Not only were they lighter, but they seemed more yellowish in color than orange (Fig. 2). The loss in intensity of colour is not only due to oxidation of the unsaturation of carotene but also shift from trans to cis form [11]. Keeping a lid on the cooking vessel had some advantage as there was about more retention of carotenes in these vegetable. seem more yellow than the raw carrots. Not only are they lighter, but they seem more yellowish in color than orange.

In phase II when the Ph was altered by addition of vinegar there was immediate change in the colour. The carrots reduced to a lighter shade compared to control. when the PH was reduced to alkaline phase by adding baking soda the colour turned darker. The colour is little affected by acid, alkali and the volume of the water. According to Nunn M et al. 2006, more investigations are needed to provide a better understanding of the oxidative phenomena of carotenoids during cooking since different vegetables have different chemical and physical characteristics.

Fig. 1: Chlorophyll pigments - Beans

Fig. 2: Carotenoid pigments - carrots

Conclusion

The boiling and steaming methods on chlorophyll had the least color change, although they seemed little brighter. A second color change occured in response to acidic water: The magnesium ion in the center of the chlorophyll molecule is replaced with a hydrogen atom, causing the green to dull. Chlorophyll-a becomes grey-green pheophytin-a, and chlorophyll-b turns into yellowish pheophytin-b. When the boiling water was slightly alkaline, then chlorophyll retained green. Accordingly boiling in open pan and latter closing can be followed for glv to maintain the natural colour of chlorophyll. Colors of carotenoids did not fade much in response to heat. Some change occurred, in carrots. The taproots change from red-orange to more yellow when cooked. Boiling resulted in intense yellow than the raw carrots. Steaming resulted in brighter orange than the rest of the carrots. There was an immediate change in the carrot when acid was added It turned lighter, while addition of baking soda led to little bit darker. cooking methods and Ph had a strong impact on the pigment retention of pigments in green and yellow vegetables. However, upon considering all the evidence steaming can be suggested as the best cooking methodto preserve the most of the phenolic compounds, particularly flavonoids and glucosinolates.

Key Messages

Cooking in general affects the texture of all foodstuffs Considerable quantities of vegetable pigments may also be lost during household cooking methods.

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[9] National Statistics Online—Trends in suicide by method in England and Wales, 1979-2001. www.statistics.gov.uk/downloads/theme_health/HSQ20.pdf (accessed Jan 24, 2005): 7-18. Only verified references against the original documents should be cited. Authors are responsible for the accuracy and completeness of their references and for correct text citation. The number of reference should be kept limited to 20 in case of major communications and 10 for short communications.

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