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Review Article

PROMOTION OF TURMERIC FOR THE FOOD/PHARMACEUTICAL INDUSTRY IN NIGERIA

Abstract:

This paper seeks to promote turmeric (*Curcuma longa* Linn) through increased awareness of the potentials of the crop in the food, cosmetic and pharmaceutical industries in Nigeria. Nigeria can play a leading role in turmeric production but this potential has not been fully harnessed as the production techniques required are poorly understood hence production have been restricted to homestead garden. Increased production and processing of turmeric as highlighted in this paper, has the potential of making a significant impact on the economy. This is because it has diversified uses and it is highly valued as major source of foreign exchange in the international market. Turmeric is used as a spice and is the main constituent of curry powder. Besides its use as a spice, turmeric finds a place in the cosmetics industry for its brilliant yellow colour and characteristic perfume. It is also being used as a dye for colouring fabrics. It is medically used for treating various kinds of diseases as also highlighted in the paper. It is thus recommended that farmers should be properly sensitized on the potentials of turmeric especially in the southern part of Nigeria where the Research institute that has the mandate to research into the crop is located. There is also need to develop improved varieties of the turmeric to boost production. Farmers should be provided with inputs like fertilizers and other agro-chemicals at subsidized rates in order to increase their production.

Keywords: Promotion; Turmeric; Food and Pharmaceutical industry; Nigeria

Introduction:

Turmeric is a shallow-rooted crop and an herbaceous plant with thick and fleshy rhizomes. It belongs to the genus Curcuma and to the family, *Zingiberaceae,* and consists of many species. *Curcuma longa* Linn is the highest yielding turmeric of commercial value. Its origin has been traced to South and Southeast Asia. Turmeric is used as a spice and is the main constituent of curry powder. Besides its use as a spice, turmeric finds a place in the cosmetics industry for its brilliant yellow colour and characteristic perfume. It is also being used as a dye for colouring fabrics among other uses. It is medically used for treating various kinds of diseases. It is reach in yellow food pigment called curcuminoid (6%) and essential oils (5%) (Nunes, 1989), and highly valued as major source of foreign exchange in the international market. It has diversified uses. Curcuminiods, the active principles in turmeric-rhizomes, have anti-inflammatory, antimutagen, anticancer, antibacterial, anti-oxidant, antifungal, antiparasitic and detoxifying properties

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(Sugiyama et al, 1996; Ishimine et al., 2003). Curcumin and volatile oils of turmeric improve liver and kidney functions, and could be used against biliary disorders, diabetic and hepatic disorders (Hermann and Martin, 1991).
India is the largest producer of turmeric supplying 94% of the world's demand (Plant cultures2005). It is cultivated on a commercial scale and exported as dried rhizomes which are later prepared into different forms to meet diverse end uses.

In Nigeria, turmeric is cultivated mostly in the homestead gardens in about 19 states and given different local names depending on the locality (Olojede *et al* 2005). It is called atale pupa in Yoruba; gangamau in Hausa; nwandumo in Ebonyi; ohu boboch in Enugu (Nkanu East); gigir in Tiv; magina in Kaduna; turi in Niger State; onjonigho in Cross River (Meo tribe) (Foodhaccp.com).

Turmeric is reported to grow under diverse tropical conditions with altitudes ranging from sea to 1500m above sea level (Rena and Madan 2001) on a well drained sandy or clay loamy soil and temperature ranging between 20-30°C with an annual rainfall of 1500 mm or more.
Turmeric readiness for harvest is indicated by the drying of the plant and stem, approximately 7 to 10 months after planting, depending on cultivar, soil and growing conditions. The rhizome bunches are carefully dug out manually with a spade, or the soil is first loosen with a small digger, and clumps manually lifted. It is better to cut the leaves before lifting the rhizomes. Rhizomes are cleaned from adhering soil by soaking in water, and long roots are removed as well as leaf scales. Rhizomes are then further cured and processed, or stored for the next year's planting (Anandaraj, et.al, 2001;, Govindarajan, 1980; Dahal, and Idris, 1999; Weiss, 2002). Rhizomes for seed purposes must be stored in well-ventilated rooms to minimize rot, but covered with the plant dry leaves to prevent dehydration (Govindarajan, 1980). They can also be stored in pits covered with sawdust, sand, or panal (Glycosmis pentaphylla) leaves that may act as insect repellent (Anandaraj, et.al, 2001).

In view of the prevailing favourable soil and climatic conditions in Nigeria, the country can play a leading role in turmeric production. Albeit, this potential has not been fully harnessed as the production techniques required are poorly understood hence production have been restricted to homestead garden (Olojede et al, 2005). The production of turmeric per unit area is very low because of the poor knowledge on proper cultivation technology of the farmers (Ishimine et al., 2003). Weeds cause reduction in the crop yield and takes extra cost in the total labour use in crop production. Akobundu (1987) stated that weed results in 65% reduction in yield of root and tuber crops and takes 25% of total labour use in production. Weed competition has also been identified as a constraint to root and tuber crop production (Unamma, 1984.).

Turmeric is propagated vegetatively through the rhizome. But unlike other root and tuber crops in which the seed type and seed bed requirements for optimum performance are well understood, this information is lacking with respect to turmeric production in Nigeria.

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The Turmeric powder is highly valued as base material for curry production in confectionery industries for food seasoning and in the international market especially in US, UK and Middle East as a functional food due to its health promoting properties. India is the largest producer of turmeric supplying 94% of the world's demand (Plant cultures, 2005). Turmeric is part of Indian's culture: it is an important ingredient in curry dishes; it is also used in many religious observances, as a cosmetic, a dye, and it enters in the composition of many traditional remedies (ASTA 2002, Dahal et al, 1999, Narayana *et al.,* 2000). As spice, turmeric is used in adding unique flavor and color to oriental curries and various other dishes. It is also used in mixed pickles, particularly the mustard pickles, chutneys and Indian rice dishes. Turmeric is also used as herbal medicine in the treatment of ulcers and liver disorders. The anti-bacterial and antiseptic properties of turmeric are well known. Recently, scientists have discovered that turmeric is a natural protectant, having an effective cancer chemo-preventive agent. On account of its flavour and medicinal properties, turmeric is also used in the preparation of cosmetics, soaps, ointments, face creams, toothpastes *etc.* (Pujari *et al.,* 1986). Among the several spices, turmeric ranks second with regard to its foreign exchange earning being next only to chilli (Babu, 2008).

Turmeric root features dark brown skin on the exterior and deep orange-yellow flesh internally. Its leaves as well as rhizome features unique flavor and fragrance. Taste is described as mild peppery to warm and bitter while its fragrance is sweet and pleasant, slightly reminiscent of a mix of orange-zest and ginger to which it is related. Once harvested, the root is boiled, dried, and ground to make the distinctive bright yellow spice powder.

Curcuminoids the active ingredient in turmeric rhizomes is known to have some medicinal properties and has been used efficiently in the treatment of circulatory problems, liver diseases, dermatological disorders and blood purification (Ishimine *et al.,* 2003). The average composition of turmeric is moisture
(6.0%), protein (6.5%), ash (6.0%), crude fibre (3.0%), starch (5.0%), fixed oil (3.5%), volatile oil (4.5%) and curcumin (3.1 %) (Manjunathetal., 1991).

Turmeric and its potentials

Table 1: Turmeric, Nutritive Value per 100g.

(Source: USDA National Nutrient data base)

Principle	**Nutrient Value**	**Percentage of RDA**
Energy	354 Kcal	17%

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Carbohydrates	64.9 g	50%
Protein	7.83 g	14%
Total Fat	9.88 g	33%
Cholesterol	0 mg	0%
Dietary Fiber	21 g	52.5%
Vitamins		
Folates	39 µg	10%
Niacin	5.140 mg	32%
Pyridoxine	1.80 mg	138%
Riboflavin	0.233 mg	18%
Vitamin A	0 IU	0%
Vitamin C	25.9 mg	43%
Vitamin E	3.10 mg	21%
Vitamin K	13.4 µg	11%
Electrolytes		
Sodium	38 mg	2.5%
Potassium	2525 mg	54%
Minerals		
Calcium	183 mg	18%
Copper	603 µg	67%
Iron	41.42 mg	517%
Magnesium	193 mg	48%

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Manganese	7.83 mg	340%
Phosphorus	268 mg	38%
Zinc	4.35 mg	39.5%

Table 2: Turmeric imports in the US in the period 1998-2002 (metric tons; US $1,000)

	1998	**1999**	**2000**	**2001**	**2002**
Turmeric (MT)	2,284	2,641	2,427	2,404	2,383
Value (US $1,000)	3,849	3,614	2,904	2,488	2,955

Weiss, 2002

Primary Products

According to FAO (2004), there are two dominant types of turmeric found on the world market: 'Madras', and 'Alleppey', both named after the regions of production in India. The orange-yellow flesh Alleppey turmeric is predominantly imported by the United States, where users prefer it as a spice and a food colorant (ASTA, 2002). Alleppey turmeric contains about 3.5% to 5.5% volatile oils, and 4.0% to 7.0% curcumin. (ASTA 2002; Buescher and Yang, 2000; Weiss, 2002). In contrast, the Madras type contains only 2% of volatile oils and 2% of curcumin (ASTA, 2002). The Madras turmeric is preferred by the British and Middle Eastern markets for its more intense, brighter and lighter yellow color, better suited for the mustard paste and curry powder or paste used in oriental dishes (ASTA, 2002; Govindarajan, 1980).

- ***Dried rhizome***

Turmeric is mostly imported as a whole rhizome, which is then processed into powder or oleoresin by flavor houses and the industrial sector (ASTA, 2002; Govindarajan, 1980). Rhizomes come as fingers, bulbs and splits. Fingers are the secondary branches from the mother rhizome, the bulb, and splits are the bulbs cut into halves or quarters before curing (Govindarajan, 1980; Tainter and Grenis 2001).The fingers are 2 to 8 cm long and 1 to 2 cm wide, and are easier to grind than the more fibrous bulbs and splits, and therefore command a higher price (ASTA, 2002). Rhizome quality is judged by a clean and smooth skin, uniform skin and flesh colors, and a clean snap (or "metallic twang") when broken (Weiss, 2002). Turmeric cleanliness specifications for import pertain to whole rhizomes (ASTA, 2000).

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- ***Turmeric powder***

Ground turmeric is mostly used on the retail market, and by the food processors. Rhizomes are ground to approximately 60-80 mesh particle size (Buescher, and Yang, 2000). Since curcuminoids, the color constituents of turmeric, deteriorate with light and to a lesser extent, under heat and oxidative conditions (Buescher, and Yang, 2000), it is important that ground turmeric be packed in a UV protective packaging and appropriately stored. Turmeric powder is a major ingredient in curry powders and pastes. In the food industry, it is mostly used to color and flavor mustard (ASTA 2002). It is also used in chicken bouillon and soups, sauces, gravies, and dry seasonings (Tainter, and Grenis, 2001). Recently the powder has also been used as a colorant in cereals (Buescher, and Yang, 2000).

Secondary and derived product

- ***Curry powder***

Turmeric is an important ingredient in curry powder. The turmeric content in curry powder blends ranges from 10-15% to 30% (Govindarajan, 1980). Typical Indian curry powder for meat and fish dishes contains 20-30% turmeric, 22-26% coriander, 12% and10% cardamom and cumin, respectively, 4% or 10% fenugreek, ginger, cayenne, cloves and fennel in proportions from 1% to 7% (Govindarajan, 1980). Curry mixes for vegetarian dishes contain less turmeric, in the range of 5 to 10%, because of the bitter flavor it would impart to the dish.

- ***Oleoresins***

Turmeric extractives, or oleoresins, are obtained by solvent extraction of the powdered or comminutated rhizome. This process yields about 12 % of an orange/red viscous liquid, which, depending on the solvent used for extraction and on the turmeric type and cultivar, contains various proportions of the coloring matter, i.e. the curcuminoids, the volatile oils which impart the flavor to the product, and non-volatile fatty and resinous materials (Govindarajan, 1980).
The compounds of interest in turmeric oleoresin are the curcuminoids (40 to 55%), and the volatile oils (15 to 20%) (Buescher, and Yang, 2000; Govindarajan,1980). The curcuminoids, which consist mostly of curcumin (1,7-bis(4-hydroxy-3-methoxyphenyl)-1,6-heptadiene-3,5-dione), and also demethoxycurcumin, and bisdemetoxycurcumin, can be further purified to a crystalline material, and will be used preferably in products where the turmeric flavor is undesirable, such as cheese, ice cream, beverages and baked products (ASTA, 2002). Curcumin has similar color characteristics than the synthetic food colorant tartrazine; however, unlike tartrazine, it is highly sensitive to light and alkaline pH, and is also degraded by heat and chemical oxidants. It is therefore not easy to use in food processes and products destined to long-term storage. It is nevertheless of commercial interest as a natural food colorant, and research is underway to improve its stability (Buescher, and Yang, 2000).

- ***Essential oil***

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Turmeric essential oil has little interest in the Western food industry, and it has no commercial value, as opposed to oleoresin (Govindarajan, 1980; Weiss, 2002). However, there is an increasing literature showing medicinal activities of turmeric, of which some are attributable to compounds present in the volatile fraction (Jayaprakasha et al., 2001).Turmeric essential oil is obtained by distillation (Weiss, 2002), or by supercritical fluid extraction of the powdered rhizome (Gopalan, et al., 2000).

How to Use Turmeric:

According to Katie-wellness mama (2013),

- Turmeric can be used externally in poultices to sooth skin and reduce inflammation. It is often used in lotions or preparations for skin with eczema or psoriasis.
- When incorporated into the diet it can be helpful for reducing inflammation in those with arthritis.
- Turmeric can be made into a paste with water or honey to make a skin scrub that cools inflammation and helps stop acne.
- Externally, a paste of turmeric and aloe vera gel can ease pain and itching from burns, bites, chicken pox, poison ivy or eczema.
- In a soothing Turmeric Tea to sooth during illness or improve sleep. This is one of my favorite uses! See my recipe below.
- It is wonderful to add to grilled foods, vegetables, mashed cauliflower, sauces and spice blends. I add a pinch to my eggs in the morning and to most dishes that I cook.
- Turmeric's high antioxidant content makes it beneficial for the skin and it is used in some natural sunscreens and bronzers. A paste of Turmeric and strong brewed black tea will temporarily darken the skin and there is some evidence that it might also provide some sun protection.
- Turmeric is said to be great for the skin and can be used in facial washes and scrubs to sooth skin and even out skin tone. Turmeric can cause hair to become less thick so it is often used my Indian women on unwanted facial hair but should be avoided on the head or by men on their faces.
- Turmeric is a wonderful spice to add to soups and stews as it gives them a rich, warm flavor and a beautiful color. If you make homemade bone broth, a couple teaspoons of Turmeric are a great addition.
- Many people take it as a supplement to help reduce inflammation and pain, especially those with arthritis or other inflammatory conditions.

- ***Medicinal and biological properties of turmeric***

Turmeric and isolated compounds from turmeric have demonstrated a remarkable variety of beneficial pharmacological activities. These include antioxidant (Subramanian, et. al.,1994;

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Ruby et.al.,1995), antiarthritic, antimutagenic (Polassa et.al., 1992), antitumor (Rao et.al., 1995), anti-tumor promotion (Surh, 2002), antithrombotic (Srivastava et.al.,1985; Srivastava et.al.,1995), antivenom by neutralizing the hemorrhagic effect of the venom in mice (Ferreira et.al., 1992), antibacterial (Negi et.al.,1999), antifungal (Lutomski et.al. l974), antiviral (Mazumder et al. 1995), nematocidal (Kinchi et al. 1993), choleretic and antihepatotoxic (Kiso, et al. 1983) activities. Low incidence of Alzheimers disease in regions where turmeric is extensively used in cuisine and as an herbal remedy suggests that it may protect against this disease since areas of high consumption such as those in India have very low Alzheimers incidence (Travis, 2001) .Further, a transgenic mouse model of Alzheimers has shown favorable response to curcumin therapy (Lim, et.al., 2001).

Little or no toxicity is reported for humans receiving large (8 g/day) (Cheng, et al 2001) therapeutic doses of curcumin, an important major component of turmeric.

All these revelations about the potentials of turmeric make it a good candidate for development of pharmaceuticals, nutraceuticals, or food ingredients with functional properties.

Problems faced by the turmeric growers

The major input problems perceived by the turmeric growers were non-availability of manures and fertilizers in time and high cost of planting material and cost of fertilizers, respectively.

Regarding labour problems, non availability of labour in time and high cost of labour were the major problems faced by the turmeric growers.

The important financial problems expressed by the turmeric growers were insufficient credit and very high rate of interest and inadequate guidance on credit availability.

Market is far away was the main marketing problem as expressed by the turmeric growers.

The general problems faced by the turmeric growers were irregular and insufficient supply of electricity for irrigation followed by insufficient irrigation water.

Conclusion and Recommendation

Turmeric is a versatile plant with medicinal and culinary uses. Turmeric benefits are extensive and side effects are few. It comes as no surprise that this is a popular choice in foods and traditional medicine. Tumeric production should thus be encouraged by sensitizing farmers properly on the potentials of turmeric especially in the southern part of Nigeria where the Research institute that has the mandate to research into the crop is located. There is also need to develop improved varieties of the turmeric to boost production. Farmers should be provided with inputs like fertilizers and other agro-chemicals at subsidized rates in order to increase their production. There is also need to provide market information like price of turmeric products to the farmers.

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