Drying of Ginger, Turmeric and Guduchi in solar-biomass hybrid drier

**Zingiber officinale** Rosc. (Ginger), *Curcuma longa* Linn. (Turmeric) and *Tinospora cordifolia* (Willd.) Miers. ex Hook. f. & Thoms. (Guduchi) are the important spices and herbs. Ginger and turmeric are widely grown in different regions of India and are commercially important edible spices. Guduchi, as a drug plant, has bulk demand in the market ranging from 300 to 500 tonnes of dry woody stems annually. All these three products required careful drying before producing them to the market.

Various drying techniques are employed to dry different food products. Each technique has its own advantages and limitations. Choosing the right drying techniques is thus important in the process of drying of these perishable products. The Brace type solar drier is one of the few designs that have achieved some level of acceptance. One significant disadvantage of this drier is that it is normally not used with any form of back-up heating. To reduce its dependence on solar radiation for operation and to improve the quality of drying, a biomass stove was incorporated with solar drier. It has extended the period of drying beyond sunshine hours, and perhaps during night as well, while drying high-value products.

The scientists at Center for Rural Development and Technology, Indian Institute of Technology, New Delhi, evaluated the performance of the solar-biomass hybrid drier against ‘solar-only’ and open sun conditions. Experiments have been conducted to test the performance of the drier by drying of ginger, turmeric and guduchi during the summer climate in Delhi. It was found that, during the load test for ginger, 18 kg of fresh product with an initial moisture content of 319.74(db)% was dried to a final moisture content of 11.8(db)% within 33 hours. Similarly, moisture content of turmeric and guduchi were reduced from 358.96 to 8.8 (db)% and 257.45 to 9.67(db)% during 36 and 48 hours of drying, respectively. The drying of these products has also been studied under ‘solar-only’ and open sun in the same climatic conditions and the results indicate that for all the products, drying is faster, and is within 33–48 hours in hybrid drier, against 72-120 hours in ‘solar-only’ operation of the same drier and 192-288 hours in open sun.

Efficiency of the drier during its two mode (solar and biomass separately) of operation has been estimated and quality evaluation of under-studied products showed that developed drier is suitable for the drying of these products. The developed drier is a simple system, which can be manufactured locally and can be used for drying of other agricultural products [Prasad Jaishree and Vijay VK, Experimental studies on drying of Zingiber officinale, Curcuma longa and Tinospora cordifolia in solar-biomass hybrid drier, *Renewable Energy*, 2005, 30 (14), 2097-2109].

## Nitric oxide scavenging activity of certain spices *in vitro*

The scientists at Department of Radiobiology, Kasturba Medical College, Manipal, Karnataka evaluated the plant extracts of some important spices for their possible regulatory effect on nitric oxide (NO) levels using sodium nitroprusside as a NO donor *in vitro*. Most of the extracts tested demonstrated direct scavenging of NO and exhibited significant activity and the potency of scavenging activity in the following order: *Foeniculum vulgare* Mill. (aqueous) > *Citrus limettioides* Tanaka > *Murraya koenigii* (Linn.) Spreng. (seed, aqueous) > *Murraya koenigii* (leaf, aqueous) > *Curcuma aromatica Salisb.* (aqueous) > *Murraya koenigii* (leaf, dichloromethane:methanol) > *Mentha arvensis* Linn. (chloroform) > *Mentha arvensis* (aqueous) > *Curcuma longa* Linn. > *Gingko biloba* Linn. > *Foeniculum vulgare* (dichloromethane:methanol) > *Zingiber officinale* Rosc. (aqueous) > *Curcuma aromatica* (ethanolic) > *Murraya koenigii* (seed, dichloromethane: methanol). All the evaluated extracts exhibited a dose-dependent NO scavenging activity. The aqueous extract of *Foeniculum vulgare* showed a greatest NO scavenging effect of 79.75% at 62.5 mg/mL as compared to the positive control, *Gingko biloba* where 36.22% scavenging was observed at similar concentration. The results suggest that these spices might be potent and novel therapeutic agents for scavenging of NO and the regulation of pathological conditions caused by excessive generation of NO and its oxidation product, peroxynitrite [Baliga MS, Jagetia GC, Rao SK and Babu K, Evaluation of nitric oxide scavenging activity of certain spices *in vitro*: a preliminary study, *Nahrung*, 2003, 47 (4), 261-264].
Microwave drying characteristics of Parsley

Parsley (*Petroselinum crispum* Mill.) is a widely used culinary, medicinal and aromatic plant. The fresh or dried leaves, roots and seeds of this plant are used in the food, cosmetics and pharmaceutical industries to produce spice, essential oils and drugs. In food preparation, the fresh parsley leaves are used as a garnish and for seasoning. The dried leaves known as parsley flakes are particularly used in the instant food sector as an ingredient to flavour soups and sausages. Drying is one of the oldest preservation techniques. Natural drying (drying in the shade) and hot air drying are still most widely used methods to produce dried parsley flakes, because of their lower cost. Natural drying has many disadvantages due to the inability to handle the large quantities and to achieve consistent quality standards.

At Department of Agricultural Machinery, Faculty of Agriculture, University of Mustafa Kemal, Tayfur Sokmen Campus, Turkey, Parsley leaves were dried in a domestic microwave oven to determine the effects of microwave output power on drying time, drying rate and the dried product quality in terms of colour. Seven different microwave output powers ranging from 360 to 900 W were used in the drying experiments. Drying took place mainly in constant rate and falling rate periods. After a short heating period a relatively long constant rate period was observed. Approximately 40-5% of the water was removed in this period. The rapidly decreasing falling rate period followed the constant rate period. As the drying progressed, the loss of moisture in the product caused a decrease in the absorption of microwave power and resulted in a fall in the drying rate. Increasing the microwave output power resulted in a considerable decrease in drying time (*probability P* < 0.01). The semi-empirical Page's equation used to describe the drying kinetics of dried leaf materials gave an excellent fit for all data points with values for the coefficient of determination *R*² of greater than 0.997 and for the standard error of estimates (SEE) of lower than 0.0188. The value of the drying constant increased with increased microwave output power. No significant differences were observed between the colour parameters of fresh and microwave-dried leaf materials, except for some decrease in whiteness *L* value (*P* > 0.05). The change in colour values was not dependent on the microwave output power. Although some darkening occurred, microwave drying maintained a good green colour close to that of the original fresh parsley leaves. By working at 900 W instead of 360 W, the drying time could be reduced by 64% with a good quality product. As an overall conclusion, compared to hot air drying, microwave drying technology can greatly reduce the drying time and successfully be used to produce good quality dried parsley flakes in terms of colour [Soysal Y, Microwave Drying Characteristics of Parsley, *Biosyst Eng*, 2004, 89(2), 167-173].

Innovative process for the production of spices

The scientists at Hohenheim University, Germany have developed an innovative process for the production of spices on pilot-plant scale. During experiment immediately after harvest, fresh chili and green pepper (fruits), ginger (rhizomes) and coriander (whole plant) were blanched and subjected to coarse and fine grinding prior to lyophilization. Alternatively, thermal treatment was applied after processing the fresh plant material into a paste. Microbiological assays revealed low counts of aerobic germs, aerobic spore forming bacteria, *Escherichia coli*, coliforms, *Staphylococcus aureus*, *Bacillus cereus*, yeasts and moulds, and sulfite reducing clostridia. *Salmonella* as well as aflatoxins were not detected in any of the products. Because the spice powders obtained were generally characterized by improved colour, in contrast to conventional spice processing, early inactivation of endogenous enzymes may have prevented degradation of plant pigments and browning [Schweiggert Ute, Mix Klaus, Schieber Andreas and Reinhold Carle R, An innovative process for the production of spices through immediate thermal treatment of the plant material, *Innov Food Sci Emerg Technol*, 2005, 6(2), 143-153].