

A Review on Post Harvest Management of Lemongrass

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ARTICLE ID:029

Introduction

Lemongrass is mostly a perennial plant. It grows in several states in India. Lemongrass was introduced almost a century ago in India and is now cultivated for commercial purposes. The oil extraction is one such commercial use. After the extraction of oil, the residual grass is a by-product that is often discarded.

Lemongrass paper is made after the extraction process of the oil. The grass is then steamed and made into sheets of paper. Both papers are 100% natural and a great example of up cycling and can be used for printing, writing and packaging. However, this has shown great potential to be turned into paper. The process of extraction somehow seems to strengthen the fibres for paper making. The fibres are beautiful and strong and turn into smooth resilient paper. Cotton fibres' are added to further smoothen the paper. This is a great example of up cycling, as this residual waste is often burned down and can contribute to pollution and landfill waste.

Lemongrass is a tropical perennial plant which yields aromatic oil. The name lemongrass is derived from the typical lemon-like odour of the essential oil present in the shoot. The herb originated in Asia and Australia. Lemongrass was one of the herbs to travel along the spice route from Asia to Europe. Lemongrass oil of commerce is popularly known as Cochin oil in the world trade, since 90% of it is shipped from Cochin port. The state of Kerala in India had the monopoly in the production and export of lemongrass oil. The annual world production of lemongrass oil is around 1000 t from an area of 16000 ha. In India, it is cultivated in an area of 4000 ha and the annual production is around 250 t. The crop is extensively cultivated in the poor, marginal and waste lands and also along the bunds as live mulch. The well ramified root system of the plant helps in soil and water conservation

Harvesting of the Herb

Harvesting is done by cutting the grass 10 cm above the ground level, with the help of sickles. The number of harvests in a year depends on the climatologically factors such as temperature, rainfall and humidity and level of soil fertility. Generally, the crop thrives best in humid condition. Cutting can begin as soon as the nights dews have evaporated from the plants, as wet grass left for later distillation quickly ferments. Sunny days are preferable, since cloudy and misty conditions tend to depress leaf oil content. Chandra et al (1970) have suggested first harvest at 75 days after planting, second at 120-130 days after first harvest and the third at 150-160 days after second harvest. However, Nair et al (1979) and Shiva (1998) have suggested that first harvest can be taken at 90 days after planting and subsequent harvest at 50-55 days interval up to 5-6 years from the same crop. Rao *et al* (2005) reported five months for the citral content to reach a maximum for the first and the sixth harvest. During the first year of planting, three cuttings are obtained and subsequently 5-6 cuttings per year (Subramanyam and Gajanana, 2001). The harvesting season begins in May and continues till the end of January. An herbage yield of 10-15 t/ha/harvest may be obtained. The herb yield of lemongrass differed significantly between years. The yield in the second year was significantly higher than that of the first, third, fourth and fifth year.

Seed Collection

Lemongrass kept for seed purpose is not cut as yield of seeds from plants subjected to regular harvest is very low. Generally, the plant flowers during November/December in plains and mature seeds are collected during January / February. A healthy plant gives 10 to 20 g of seeds. The whole inflorescence is cut and dried in the sun and seeds are collected by thrashing against the floor or beating with sticks. Fresh seeds are recommended for use in raising a plantation since the seeds lose viability beyond six months of storage. Seed germination is very poor till May, increases up to July and thereafter decreases. Germination is meager beyond October (Thomas, 1995).

CHEMICAL COMPOSITION

Chemical composition of herb the spent grass on an average contains N 0.74%, P 0.07%, K 2.12%, Ca 0.36%, Mg 0.15%, S 0.19%, Fe 126.73 ppm, Mn 155.82 ppm, Zn 35.51 ppm and Cu 56.64 ppm (Joy, 2003).

Chemical composition of essential oil

The essential oil of *C. citratus* contains approximately α -pinene (0.13%), β -pinene, delta-3catrene (0.16%), myrcene (12.75%), dipentene (0.23%), β -phellandrene (0.07%), β -cymene(0.2%), methyl heptanene (2.62%), citronellal (0.73%), β -elemene (1.33%), β -caryophyllene(0.18%), citronellyl acetate (0.96%), geranyl acetate (3.00%), citral b (0.18%), citrala(41.82%), geraniol(1.85%), elemol(1.2%) and β caryophylleneoxide(0.61%)(Saleem *tal*,2003a,b).

Uses in Food Processing

Uses of herb

Herbal teas

Dried lemongrass leaves are widely used as a lemon flavour ingredient in herbal teas, prepared either by decoction or infusion of 2-3 leaves in 250 or 500 ml of water (Wannmacher et al, 1990) and other formulations. Lemongrass tea is a diuretic and imparts no biochemical changes to the body in comparison with the ordinary tea. Lemongrass iced teas prepared by steeping several stalks in a few quarts of boiling water. This can also be combined with green or black teas.

Health food

Lemongrass is commonly used in Asian cooking. When Thai food was embraced in the US, lemongrass became a household name. A little experimentation with this delightfully fragrant herb is all it takes to realize that it can be used in many more ways than just in Asian dishes. A simple syrup made by steeping lemongrass in a mix of equal parts hot water and sugar can be used to enhance fruit salads or to make homemade soda by mixing it with seltzer. A blend of lemongrass, garlic, ginger and oil will be stable in the freezer during winter. This paste can be fried until fragrant and then cooked down with a can of coconut milk (strain to remove tough lemongrass fibres) for delicious sauce for noodle, vegetable or seafood dishes. Lemongrass flavours meat, chicken and seafood dishes of South Asia and South East Asia. It gives Sri Lankan, Thai, Malaysian, Vietnamese and Indonesian dishes their distinctive lemony tang. These countries on the rim of the Indian Ocean have seafood as

staple food, and lemongrass takes the edge off the fishy odour. In Thailand and Indonesia, freshly ground lemongrass is added to spice pastes. The Vietnamese like to prepare their food at the dinner table, mixing meat with fresh herbs, and lemongrass is an essential herb at the table. Vietnamese add the fresh grass to broth in which mutton and beef are cooked. They also smoke meats with chopped grass. The cuisines of Southeast Asia use coconut milk extensively, and lemongrass goes well with this and other commonly used herbs and spices like ginger, lime leaves, bay leaves, coriander, black pepper, mint, and nutmeg. The herb's popularity comes from the mildness of its fragrance, which does not overpower the senses the way lime does. The grass also spices soups and herbal teas. Lemongrass, along with black pepper, is also a remedy for menstrual disorders. The herb decoction is a tonic and digestive.

Other Thai lemongrass preparations Tom Yum Koong

Thai traditional jumbo shrimp soups with lemongrass, lime leaf, mushrooms, chilly paste, and lime juice. Garnished with cilantro.

TomKaKai – Sliced chicken breast cooked in coconut milk with mushrooms, galangal, lemongrass, lime leaf, and chilies paste. Garnished with cilantro.

Tom Yum PohTak – Seafood combination in spicy soup with lemongrass, lime leaf, mushrooms, chilies paste, and lime juice. Garnished with cilantro.

Tom Yum Kai– Sliced chicken breast in spicy soup with lemongrass, lime leaf, mushrooms, chilies paste, and lime juice. Garnished with cilantro

Yum – Grilled B.B.Q. beef, pork or chicken steak, sliced and tossed with lime dressing, chilies, red onions, tomatoes, cucumbers, and lemongrass. Garnished with lettuce, scallions, and a mint leaf or sweet basil.

Yum seafood – Combination seafood and tossed with lime dressing, chilies, red onions, tomatoes, cucumbers, and lemongrass. Garnished with lettuce, scallions, and a mint leaf or sweet basil.

Uses of essential oil

Lemongrass is cultivated for its oil which is used in culinary flavoring. It is used in most major categories of food including alcoholic and non-alcoholic beverages, frozen dairy desserts, candy baked foods, gelatins and puddings, meat and meat product, and fat and

oils. It is used to improve the flavour of some fish and can be used to flavour wines, sauces etc. It is used for the isolation of citral for vitamin A and many other aroma chemicals. The oil has a very good smell of natural citral and can be used in citrus perfumes as such. It can be used for flavouring chicken and rice preparation. It is a unique flavour for Green tea. The oil has very good aroma therapeutic properties and good medicinal properties (Ranade, 2004).

Lemongrass oil was a traditional source of citral. This oil was used as a raw material for the manufacture of ionones and methyl ionones. Lemongrass oil has bactericidal properties. No limit is specified in the use of lemongrass oil in flavours and fragrances. However, citral has certain restrictions as per IFRA guidelines (Ranade, 2004). Citral, the major component of essential oil in lemongrass, is commonly used in soaps, perfumes, detergents, cosmetics, and candles. Most soaps and aftershaves with a fresh lime fragrance use citral. The essential oil is a popular ingredient in aromatherapy.

Lemongrass oil has no adverse effects on the blood, liver function, kidney function, protein, and carbohydrate and lipid metabolism of rats. Studies have failed to detect mutagenic or toxicological reactions in humans (Leung and Foster, 1996).

Uses of oleoresin

Lemongrass oleoresin is mainly used in flavouring foods, drinks and bakery preparations.

FUNCTIONAL PROPERTIES

Functional properties of herb

Leaves of lemongrass can be used as a source of cellulose in the manufacture of paper and cardboard. Reduction in root-knot nematode disease was observed in soil amended with leaves of *C. flexuosus*. In the Caribbean, lemongrass is primarily regarded as a fever-reducing herb (especially where there is significant catarrh). It is applied externally as a poultice to ease pain and arthritis. In India, a paste of leaves is smeared on patches of ringworm (Chevallier, 2001).

Functional properties of essential oil

Lemongrass oil is one of the most important essential oils widely used for the isolation of citral. Citral is the starting material for the preparation of ionones α -ionone is used in flavours, cosmetics, and perfumes. β -ionone is used for the synthesis of vitamin A. Citral b, the most common constituent of oil, could be a good inhibitor of β -glucuronidase. The oil has other uses as a bactericide, as an insect repellent and in medicine (Alam et al, 1994; Atal and Kapur, 1997). Antimicrobial cream, Wisprec made of *Ocimum sanctum* and *C. citratus* remains intact in its activity up to three years from the date of manufacturing (Tiwari et al, 1997; Prashanth et al, 2002). Its mosquito repellent activity lasts for 2-3 hrs. It exhibits significant antifeedant and larvicidal activity against *H. armigera* (Rao et al, 2000).

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