



SCIENTIFICALLY CULTIVATION OF LEMON GRASS -A POTENTIAL AROMATIC CROP

A.S. Gawali¹ and N.A. Meshram²

¹Department of Forest products and Utilization, College of Forestry,
Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri-415712, Maharashtra.

²AICRP on Agroforestry, College of Forestry, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli,
Ratnagiri-415712, Maharashtra.

Abstract

Lemon grass cultivation is commercially done for its aromatic oil. Oil contains citral which has odour like lemon, that's why the grass is also known as Lemon grass. It is perennial crop, cultivated in variety of soil, different climate, high foliage yield in a short period of time. Oil content in lemongrass was average 0.29% and 0.63% on fresh and dry weight basis, respectively. Scientific methods of cultivation give good yield and the appropriate time of harvest gives good quality of oil. Oil of lemon grass is of superior quality. Aromatic oil obtained by the method of steam distillation is useful in cosmetic industry, perfumes, soaps and detergents; also it is used for medicinal purpose as herbal tea. Thus farmers can get good income by cultivation of aromatic grasses.

Key words :

Introduction

Lemongrass is a tropical perennial plant which yields aromatic oil. Aromatic or essential oils are highly concentrated secondary metabolites of diverse functions in plant system. They constitute hundreds of organic compounds including terpenoids, benzenoids, organic sulphur and nitrogenous compounds, which work at different levels. The name lemongrass is derived from the typical lemony odour of the essential oil present in the shoot. The annual world production of lemongrass oil is around 1000 t from an area of 16000 ha. In India, it is cultivated in about 4000 ha and the annual production is around 250 t. The crop is extensively cultivated in 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. 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 and other formulations. Lemongrass tea is a diuretic and imparts no biochemical changes to the body in comparison with the ordinary tea. Lemongrass iced tea is prepared by

steeping several stalks in a few quarts of boiling water. This can also be combined with green or black teas. Lemongrass is commonly used in Asian cookery. 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 home made 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 oil is used in culinary flavouring. It is used in most of the major categories of food including alcoholic and non alcoholic beverages, frozen dairy desserts, candy baked foods, gelatines and puddings, meat and meat products and fat and oils. It is used to improve the flavour of some fish and can be used to flavour wines, sauces etc. Lemongrass oleoresin is mainly used in flavouring foods, drinks and bakery preparations.

*Author for correspondence : E-mail : anilgaw78@gmail.com

Species and varieties

Lemongrass belongs to the family *Graminae* (Poaceae) and the genus *Cymbopogon*. Generally, three species are identified (Gupta, 1969)

***Cymbopogon flexuosus* (Nees ex Steud) Wats. (2n=20, 40)**

It is known as East Indian, Cochin or Malabar grass. *C. flexuosus* is a tufted robust perennial grass of about 2 m height. The leaves are linear and lanceolate. It flowers freely. The inflorescence is very large and highly branched terminal drooping panicle bearing paired spikes on tertiary branches. The spikes bear spikelets in pairs of which one is sessile and the other pedicellate. The sessile spikelet is an awned bisexual floret where as the pedicellate is an awnless staminate floret. Under this species two varieties or types are identified based on the colour of stem.

C. flexuosus var. *flexuosus* – It is red grass. The stem and leaf sheath are reddish or purple in colour. It is recognized as the true lemongrass and is commercially cultivated (Fig. 1.1-3). The essential oil contains more than 75-80% citral, exhibits good solubility in alcohol and hence is superior in quality (Guenther, 1950). The geraniol rich variants of *C. flexuosus* with high oil content could be useful as additional sources of geraniol and not as an alternative to geraniol from *C. martini* (Kulkarni *et al.*, 1996).

C. flexuosus var. *albescens* – This white grass is characterized by the white colour of the stem. The plant is normally seen wild. The essential oil contains less than 65-70% citral, exhibits poor alcohol solubility and is hence considered inferior in quality.

***Cymbopogon citratus* (DC) Stapf. (2n=40, 60)**

It is known as West Indian or American lemongrass. It is a stemless perennial grass with numerous stiff tillers arising from short rhizomatous rootstock, making large tussocks. It seldom flowers under cultivation. Leaf blade is narrow, linear, glaucous, drooping with scabrous margin, ligule truncate, inflorescence rarely produced, a large loose panicle; spathe bracts long and narrow, sessile spikelets, awnless, linear, lanceolate. The essential oil contains 74-76% citral and exhibits poor solubility.

***Cymbopogon pendulus* (Nees ex Steud) Wats.**

It is Jammu lemongrass and is white stemmed and dwarf in nature. The plant is frost resistant and suited to Sub-Himalayan areas of North India. The essential oil contains around 75-80% citral and exhibits medium solubility in alcohol (Joy *et al.*, 2001).

Origin and distribution

Lemongrass is distributed in Africa, Indian

subcontinent, South America, Australia, Europe and North America. In India, they grow wild in all regions extending from sea level to an altitude of 4200 m. Several species are endemic to India. East Indian Lemongrass grows wild in India and is cultivated well in Kerala, Assam, Maharashtra and Uttarpradesh. It is also distributed in Guatemala and China. West Indian lemongrass is believed to have originated either in Malaysia or in Sri Lanka. It is widely distributed throughout the tropics and is grown in West Indies, Guatemala, Brazil, Congo, Tanzania, India, Thailand, Bangladesh, Madagascar and China. Jammu lemongrass is mostly confined to North Indian states such as Jammu and Kashmir, Sikkim, Assam, Bengal and Madhya Pradesh (Handa and Kaul, 2001). Traditionally lemongrass is grown in high rainfall area as a rainfed crop in Kerala state. But under semi-arid tropical conditions, it is grown as irrigated crop (Singh and Shivraj, 1999).

Cultivation of Lemon grass

Proper selection of land, which supports the plant growth for a longer period, is essential for optimum growth and satisfactory recovery of oil. For Lemon grass cultivation, deep, well drained, fertile soil is suitable, the areas with fear of water stagnation should be avoided for cultivation. Soil of around pH 6.0 is considered optimum and attitude of 150-200 m is ideal, the plant grows satisfactorily upto the height of 700 m. Humid Climate with regular rainfall is most favourable for plant growth and oil production as well. Temperature of 38 °C and 20°C do not support proper plant growth. Oil yield is north-eastern and southern part of India is higher. It grows well on poor soils along hill slopes (Ranade, 2004).

Land Preparation

Land is prepared by ploughing, discing and filling the soil for several times. Termite treatment is important, during last ploughing 5% BHC Powder, 25 Kg/ Ha, should be mixed with soil, after that leveling should be done.

Plantation

Plantation remains for the period of 4 to 5 years. Planting material is obtained by dividing the clumps from the old plantation; the divided units are called 'Slips'. Before digging out the clumps, all the leaves should be removed 20-25 cm from the ground to minimize water loss from transpiration. Lengthy roots are trimmed and the dead leaves are removed from the slips to allow quick establishment of the slips in soil and to protect it from soil born insect and pests. Slips plantation is done on flat beds or ridges depending upon the texture of the soil. Slips are placed in holes of about 5-8 cm deep and the soil surrounding the slips is properly pressed and watering

should be done. Plantation is done at 45×45 cm, 60×60 cm distance, however in areas with fairly large growing period planting distance may be increased to 70×70 cm or even 90×90 cm. Closer planting helps plantation to compete against weeds. The best time for planting is the onset of rains, in sub-tropical climates with assured irrigation, planting can also be done in the month of Jan-Feb, Feb-March, June-July. Due to control soil moisture, the percentage of crop establishment is more and the plants do not face weed competition, which is not uncommon with rainy season planting. A spacing of 30 cm \times 30 cm with a plant density of 111 000/ha is recommended. A wider spacing of 60 cm \times 45 cm for seedlings and 90 cm \times 60 cm for slips has been recommended for fertile, irrigated land under North Indian conditions (Farooqi *et al.*, 1999).

Manures and Fertilizers

Lemon grass being leafy crop removes large amount of nutrients from the soil, therefore it is general practice to supply sufficient organic manures and fertilizers. The fertilizer requirement depends on the fertility of the soil and the climatic conditions. Before plantation, 10-15 Ton/ha well decomposed FYM/compost and 100 Kg/ha is applied to the soil, second dose after every cutting near the roots of the plants. After plantation root treatment is done, 5 litres of water, 1 litre gomutra (cow urine) and 7.5 gms of bovistin should be applied. The fertilizer requirement 120 kg nitrogen, 40 kg of P_2O_5 and K_2O / hector is optimum. The time of fertilizer application should be followed as under- half of nitrogen and full P_2O_5 and K_2O at the time of plantation in first year and before hoeing and after rainfall in subsequent years, the remaining nitrogen should be applied in four equal splits after each harvest. In chromate overburdened soil, application of lime at 6 t/ha and fertilizer at 100 kg N, 50 kg P_2O_5 and 50 kg K_2O /ha produced higher plant height, tiller number and herb yield of *C. pendulus* (Behura *et al.*, 1998).

Weed Control

Lemon grass is susceptible for weed competition for few months after plantation; the problem is more in rainy season. The plantation should be kept weed free for 60-75 days, which is critical period for weed competition. Weeds can be managed by manual removal or by selective herbicides, Simazine 1.5 kg, Diuron 1kg or Oxyfluorfen 0.25 kg/ Ha applied pre planting in first year and after hoeing in subsequent years of growth. Application of organic mulch (citronella distillation waste) 5 tones/ ha, alone or in combination with herbicide has been found to be advantageous.

Irrigation

Lemon grass requires moist condition for good growth. In sub-tropical areas where rainy season lasts for 3-4 months, the crop requires regular irrigation during rain free period and 8-10 irrigations are considered to be sufficient to meet the water requirement. In areas of prolonged rainy season, the crop is cultivated as rain fed crop.

Diseases and Pests

There are two important diseases of Lemon grass, which affects the growth of plant and oil production, these are blight leaf and anthracnose. The causative organism of blight leaf is *Curvularia andropogenis*, the symptoms starts appearing in the month of July and August and continues till the month of October-November. The tips and margins of leaves turn brownish, in advanced stage major portion of leaf blade becomes brownish and leaf starts drying. Anthracnose disease is caused by *Colletotrichum graminicola*, symptoms appear on leaves with brown spots which enlarge with age. Application of dithiocarbamate is recommended for control of the disease. No serious insects or pest grow on lemon grass, however plantation in north-eastern and southern parts are affected by steam borer which can be checked by application of Carbofuron 15 kg/ha.

Harvesting

First harvesting is done from newly established plantation from 4-5 months of plantation, after that the crop harvesting is done at the interval of 3-4 months. Thus minimum 3 and maximum 4 harvest are taken in a year. Some harvesters take 5 or more harvests in a year, but frequent cutting minimize longevity of the plantation and deteriorates the oil quality.

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 (Singh and, Singh 1998).

Oil Distillation

Freshly harvested leaves are taken for the purpose of distillation. During mild weather condition the harvested leaves can be spread in shade or left in field for 12 to 24 hours to make it semi-dry. This allows better packing of plant material in distillation stills and economises the consumption of fuel also. If the leaves are over-grown, then they may be chopped into pieces into distillation stills for better oil recovery. Distillation process is completed within 3 to 3.5 hours with boiler operated plant and it takes 4 to 5 hours with directly fire plant. Steam distillation or water distillation are done for recovery of oil from citronella leaves.

Oil Content and Yield

Leaves of lemon grass contains 0.8 % of aromatic oil, which varies greatly upon the fertility of land, climatic condition of the cultivated area, cultivation method and species of lemon grass and the season of harvesting. Lemon oil recovery and content is lowest in rainy season and highest in dry months, as in hot season leaves are short but the blade size is wider. Gupta *et al.*, (1987) reported that oil content in lemongrass was 0.29% and 0.63% on fresh and dry weight basis, respectively. Nair and Shekharan (1974) also observed similar oil content in this crop.

Uses of lemon Oil

Lemon oil is widely used in perfume industry directly and indirectly. It is used extensively in soaps, detergents, house-hold cleaner, mosquito cream, Agarbatti, tea-blending etc. Oil also serves as starting material for certain important isolates such as Geraniol, Citronellol, these can be converted into some of most widely used aromatics. Oil contains α -ionone, which is precursor of Vitamin B12; it is also anti-biotic, anti-flatulent. Citronella oil is used in cough syrup to remove muscle fatigue; it is also used for wound healing. 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 (Anon, 2006).

Conclusion

Lemon grass cultivation is done on commercial basis, for obtaining aromatic oil from the leaves. Selection of proper soil, climatic conditions, method of plantation, type of lemon grass species, proper application of fertilizers and manures, harvesting etc consideration is essential. The cultivation methods and the measures taken during cultivation of lemon grass give good yield and better oil recovery from the leaves. The aromatic oil has odour like lemon because of presence of Citral in the oil, lemon has about 28% of Citral and about 80% in lemon grass. The oil is used in perfumery, detergents and also for medicinal purpose. Thus the cultivation of lemon grass is highly profitable for farmers in rainfed areas and areas with proper irrigation.

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