

Menthol Mint: India

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Mentha arvensis (commonly known as menthol mint, corn mint or Japanese mint) is widely used in the food, flavourings, pharmaceutical and cosmetic industries. There are two basic types of menthol mint — natural and synthetic. Synthetic menthol comes in the form of *l*-menthol crystals that are derived from the plant's essential oil. Industry, however, prefers the natural version because the scent of synthetic menthol is affected by contaminants that arise during the crystallization process.

In addition to being a popular flavouring for food, confectionery and cigarettes, natural menthol has a cooling, soothing effect on the skin and mucous membranes of the human body, making it a useful ingredient in pharmaceuticals and cosmetics. Worldwide, approximately 10,000 tonnes of natural menthol and 2,000 tonnes of synthetic menthol are used by the pharmacosmetic and cigarette industries every year.

Until about 15 years ago, the bulk of the world's *Mentha arvensis* came from Brazil and China. China and India subsequently overtook Brazil and, more recently, India has led the world in the production of this useful plant and its products.

Mint cultivation was introduced to India as a main *rabi* season crop in the 1980s, to follow the planting and harvesting rice or pigeon pea *khari* crops. Although farmers were able to profit from this planting rotation, mint cultivation did not take off immediately in India because it generated low yields. The situation improved in the 1990s when new, improved varieties that had been developed by India's Institute of Medicinal and Aromatic Plants (CIMAP) were introduced and other varieties were imported from China. After this development, larger areas were planted with mint and CIMAP released another two new varieties (Himalaya and Kosi) leading to India winning its dominant position in world menthol production. This case study is about the latter two cultivars.

Background and Justification

Over the past few decades, India's rising population, intensified use of cultivable land, and limited availability of water, pesticides and fertilizers, combined with the country's need to produce enough food for its people, have increased the pressure for discovering new ways of making the most of land and improving existing production of essential foodstuffs.

Mentha arvensis crops were identified as valuable tools for achieving these worthwhile goals. As well as providing farmers with an extra crop every year, the rotation of menthol with other food crops was found to be a good way of helping to control pests and diseases of all the crops planted in the field. Other reasons for selecting menthol mint were that worldwide demand for mint oil had begun (and continues) to increase and the climate and geography of parts of India are ideal for mint production.

When the first mint varieties were introduced, two major problems were discovered: first, yields remained low and, second, the time required for the crop to mature made it difficult to fit around other, more important crops such as rice and potatoes. This second problem was particularly significant because the area best-suited to menthol production is also the area in which much of the country's food crops are grown.

The challenge facing CIMAP when it initiated its Improved Technology for Menthol Mint (*Mentha arvensis*) Essential Oil in India project in 1993 was to find high-yielding, disease- and pest-resistant cultivars that could be grown successfully between the harvest of such food crops as potatoes and wheat and the planting of rice in time to benefit from the monsoon season. Continual developments, culminating with CIMAP's release and follow-up of the Himalaya and Kosi varieties, led to increases in annual menthol oil production from 450 tonnes in 1982 to about 1,200 tonnes in 1999.

Description

India's "mint belt" lies in the country's "breadbasket," a strip of plains and foothills about 1,500 km long and 250 km wide, just south of the Himalayan range, spanning the states of Punjab, Himachal Pradesh, Haryana, Uttar Pradesh and Bihar.

After introducing Himalaya and Kosi varieties in the mid-1990s, CIMAP carried out extensive work to decipher optimum planting times and population densities, fertilizer and irrigation requirements, harvesting schedules and post-harvesting processing treatments for the higher yields of essential oil from mint grown at various locations in the mint belt. The methods that they developed were then passed on to growers and entrepreneurs through training, demonstrations and the media. Concerned government departments and industries also helped with getting out the word.

Feedback information to monitor the performance of the Himalaya and Kosi varieties and the profits that growers could make was collected from four major mint growing areas — Barabanki, Rampur, Moradabad and Badaun. Compared with the Chinese Shivalik variety which, with yields of 86 to 106 kilograms per hectare, was one of the best performers before the new cultivars arrived, Himalaya was found to produce 30 to 48 percent more (125 to 138 kg per hectare) and Kosi between 62 and 78 percent more (140 to 176 kg per hectare).

And that is not all. Not only are both varieties, particularly Himalaya, resistant to the rust, blight, mildew and leaf spot diseases that reduced yields of older varieties, but they also act as a barrier for the spread of diseases and pests in the fields in which they are planted.

Kosi matures in 90 days instead of the usual 120 days, and produces an essential oil that contains 75 to 80 percent menthol (compared with Shivalik's 65 to 70 percent). The shorter growing cycle means that it is easier for farmers to fit the plant into their existing cropping programmes — for example, potatoes, chickpeas and wheat — all of which are extensively grown in the plains of north India and all of which fit well with the Kosi growing cycle when it is followed by a rice crop. Farmers pursuing a rice-brassica-mint, rice-wheat-mint, or rice-potato-mint growing cycle can realize annual profits of US\$1,650 to US\$2,350 per hectare.

Kosi and Himalaya, simply put, satisfy the main demands of Indian mint growers in terms of pest resistance, yield, growing time and profitability.

Patents and Commercialization

CIMAP has filed the following patents for improved cultivars of menthol mint: New cultivar *Kosi* of menthol mint filed in the United States on 22 April 1997 and refiled in the United States on 2 September 1998.

The cultivars are being used by at least 50,000 farmers across the Indian states of Jammu, Kashmir, Himachal Pradesh, Haryana, Uttar Pradesh, and Bihar. Some farmers have been helped by the Ambedkar special employment scheme, sponsored by the government of Uttar Pradesh. The cultivars also were promoted by a demonstration and training project funded by the Department of Biotechnology of the government of India. Farmers who attended the training sessions are now spreading the word to their neighbors.

Partnerships

Apart from the Department of Biotechnology demonstration, CIMAP has collaborated with the Menthol Industry Association, illustrating its improved methods and plant varieties to about 2,000 farmers through training and awareness "camps" organized in the mint belt.

The institute is investigating the possibility of forging alliances and partnerships with other countries' national organizations and international organizations involved in the development of mint-based activities.

Replicability

CIMAP methods and varieties, which can fit into a variety of different crop cycles, could be applied in other developing countries with the appropriate climatic and geographic conditions and similar cultivation

schedules for agricultural production. International technology transfer would have to be carried out at the government level.

Lessons Learned

In India, mint tends to be cultivated by small and marginal farmers who, after harvesting rice, pigeonpea, maize or soybean in September-October, plant potato, mustard, wheat and chickpea in October-November for harvest between February and April. This means that CIMAP had to find a cultivar that could fit into the "planting gap." Kosi, which can be planted in February and matures by May, does just that.

Good practices are no use if the people who should be using them do not know about them. At the start of the project, farmers' lack of awareness was found to hinder the spread of new developments. CIMAP overcame this "knowledge gap" by holding farmers' camps in several places within the mint belt, where the new plant varieties and growing techniques were demonstrated. As a result of this experience, farmers confidence and willingness to adopt these plant varieties and growing techniques on their own farms were increased.

Other ways of raising awareness included published articles in magazines, newspapers and trade journals. CIMAP scientists also made television and radio appearances to talk about various aspects of the new mint producing system.

Impact

The cultivars have had a great impact on farmers who use them. An Indian menthol mint grower can expect to make about US\$1,000 per hectare per year, rising to US\$2,400 when a good crop rotation is followed, thanks to the short time it takes for the crop to mature. Mint growing is also a labor-intensive activity. Therefore, as the number of mint farms increase in the area, there will be more job opportunities for rural workers.

The greatest impact of all, however, takes place at the national level, as India has become the world's biggest producer of an important crop for a number of major industries. This has boosted public and government enthusiasm for and interest in menthol crops.

Future Plans

Continuing research and development activities will aim to improve menthol mint varieties and cultivation technologies even more. Other immediate objectives are better processing methods for distilling essential oil from the mint and establishing quality assurance. CIMAP also plans to investigate ways of using mint oil in agriculture on a commercial scale.

To make the most of these findings, CIMAP will hold national and international seminars on mint, funded by national and international agencies, relevant government departments and related industries.

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