

Hemp in the manufacture of paper

Hemp—*Cannabis sativa* (often called Indian hemp)—has been cultivated in India for centuries, especially in regions where rivers flood their banks, because the plant holds the soil and prevents soil erosion. The plant produces strong pliable fibres (the word 'hemp' is used for both the plant and the fibres). The fibres are extremely strong and have been used since antiquity for weaving sail cloth, and for making large diameter ropes used in ships etc.

The male plant bears flowers in axillary racemes and dies soon after pollination has taken place. The female plant bears flowers in crowded spikes and dies after the seeds mature. Plants of both sexes are used for fibre. The hemp stem is hollow and has an inner fibrous bark. While strong coarse fibres are obtained from mature plants, soft ones obtained from hemp harvested at pollination are used for making cloth of fine texture. The fibres from the bark are used to make a great variety of textile products.

Hemp contains the psychoactive drug

tetrahydrocannabinol, popularly known as marijuana. Narcotics like charas, ganja, etc. have been extracted in India from the hemp plant for centuries.

More recently, material scientists in India have considered hemp fibres as ideal for making fibre-reinforced plastic (FRP) composites because of the strength and length of the fibres. Further, hemp fibres contain a fair proportion of amorphous silica, making them behave almost like glass fibres except that hemp fibres are much tougher. Hemp fibres add strength and stiffness to plastic products and can be used to substitute glass (G) in GFRP products. Attempts to use treated hemp fibre to substitute partially asbestos in 'asbestos cement sheets' (used for roofing) have been fairly successful.

Now comes the news (*Environmental Health Perspective*, 1995, **103**, 893–894) that hemp is one of the best fibre sources for paper and therefore could be used in its manufacture. It is much better than jute, kenaf, flax or bagasse. In recent experiments, high-quality bond paper has

been produced with 10% hemp together with recycled paper pulp. Lower grade but strong paper has also been produced for copiers. Hemp paper is considered environmentally very good as no chlorine bleach or acid treatment is necessary. Cultivating hemp, it is said, will save trees and minimize pesticide demands. Since cultivating the marijuana plant in the US is illegal, hemp pulp is being imported into the US from China and Hungary. Attempts are also being made to use genetic engineering to produce hemp not containing the drug tetrahydrocannabinol. There are some negative aspects too – Hemp plants require nitrogenous fertilizers; so hemp fibres may be much costlier compared to other materials like wood, bamboo, etc. used in paper manufacture. One does not know how the high silica content in this fibre will affect the paper-making machines.

S. Ramaseshan, Raman Research Institute, Bangalore