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Application of Geothermal Water for Honey Processing

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ABSTRACT

In the age of renewable energies, geothermal energy is playing a major role in society. It is a kind of energy which is not only used in industrial and commercial based sectors but also for the societal benefits. There are various direct as well as indirect applications of geothermal energy which includes agriculture, aquaculture, balneology etc. Honey processing is a new trend of societal benefits through geothermal energy. This paper includes the various aspects of apiculture including farming, processing and marketing etc. The paper deals with types of bees used in bee keeping projects, the constraints in bee keeping, types of crops used for pollination of bees, honey extraction, types of honey processing, and application and stages involved in honey processing through geothermal water. This paper mainly talks about the water bath method for honey processing in which the geothermal water is used for filtering of honey. The treatment process is performed in two stages the first stage involves the treatment of honey for the period of 24 hours up to a temperature of 50^{o}C. While the second treatment process take place at the temperature of 75^{o}C. In these two stages the complete inactivation of enzymes takes place which leads to the honey purification.

1. INTRODUCTION

Geothermal water is utilized in many ways for direct as well as indirect applications. The annual distribution of geothermal energy includes 34% for fish farming, 28% for bathing and swimming, 15% of individual space heating, 9% for greenhouse heating, 9% for district heating, and the rest is for agricultural drying, Honey Processing, industrial process heating, cooling, and snow melting, Lund and Boyd (2015). Honey Processing is a new trend in direct applications of geothermal water. Where two different temperatures of geothermal water is used for processing bee waxes. The process of bee farming is known as “Apiculture”, which deals with all the aspects of honey bee farming. In this paper a concept is discussed regarding application of low temperature geothermal water for honey processing in Gujarat. Details about exploration and exploitation activities in Gujarat is discussed in Sircar *et al.*, (2015).

2. APICULTURE

Honey Bees have been offering services to the society through ensured pollination in cross-pollinated crops as well as by providing honey and a variety of beehive products like, royal jelly, propolies, bee wax, pollen etc. Honey is not only used as nutrient but also for medicinal purpose. An alternative medical branch is been developed known as “Apitherapy” which uses various types of honey and honey products for medication of several diseases, Molan (2001). Millions of honey bee colonies, mostly, Apis mellifera, are maintained all over the world. The world production of honey has been ranging from 14 to 15 lakh metric tonnes per year. There are 15 countries in the world which account for 90% of the world honey production. China is the only Asian country producing nearly 2.5 lakh metric tonnes of honey. India have mainly four native bee species they are (1) Apis Cerana, (2) Apis Dorsata, (3) Apis Florare and (4) Trigona Irridipennis, Thomas *et al.*, (2001). At present there are about 30 lakh bee colonies in India, producing about 94500 metric tonnes of honey (2016-17 estimates) including honey from wild honey bees. India is one of the honey exporting countries. The major markets for Indian honey are Germany, USA, UK, Japan, France, Italy, Spain etc. The Apiculture involves various stages which includes farming, processing and marketing. Through the various literature survey it is found that the geothermal water can be utilized for processing of raw honey. Using this concept an apiary is planted in Gujarat where the Apis Dorsata type of bees are utilized for honey farming (Figure 1b). Figure 1a gives the glimpse of honeybee boxes used for apiculture at Gujarat, India