Traditional system for the production of *kewda* essential oil and *attar*

D K Mohapatra & S Sahoo*

Natural Products Department, Regional Research Laboratory, Bhubaneswar 751013, Orissa
Email: sbsahoo@rrlbhu.res.in

Received 17 August 2005; revised 28 December 2006

*Kewda* (*Pandanus odoratissimus* Linn. f.) flower distillation is high value because of its flavour and fragrance. Using the age-old traditional *Deg-bhabka* method, till date the floral essential oil and *attar* are produced. This traditional method is appropriate, popular, economical and convenient for *kewda* distillation. According to the number of flowers, the size of *deg* or *bhabka* is used for distillation. Essential oil and *attar* both can be made in the same distillation unit. This system can be operated at the plantation site. The products have high demand in the market value. The traditional system of *kewda* distillation is cost effective; simple operation techniques are involved for *kewda* oil & *attar* production.

**Key word:** *Deg-bhabka, Kewda, Essential oil, Attar, Traditional distillation method*

**IPC Int. Cl.**: A61K8/18, C11B9/02

The most popular and simple methods to recover the fragrance component from floral materials in India are by distillation with water using copper cauldrons and heavily tinned copper receivers and bamboo pipes\(^1\).\(^2\). Floral essential oils (*rooh*), *attars* and hydrosols (rose water, *kewda* water, etc) are produced using the traditional *Deg-bhabka* method. Despite its drawbacks and shortcomings, products are accepted in the market. Thus, the traditional method is still popular in the acceptable innovative. There are certain advantages such as flexibility in transporting the distillation unit to the place of availability of raw materials and convenient system of operation without electricity and pumped water supply. The drawbacks overwhelm due to crudity of the equipment and dependence on the skill of the operator. Basically there are three types of essential oil distillation and they differ in the degree of contact of plant material and water/steam\(^3\). In the first type (water distillation), the charge is wholly or partly immersed in boiling water. In the second type, the plant material is supported above the boiling water by a grid. This is known as water-steam or hydro-distillation. In the third type (steam distillation), wet of dry steam is passed in to the plant material to vaporize the oil. The water and steam distillation techniques represent a typical case of saturated low-pressure steam distillation, where maximum temperature is limited to 100°C and over heating is avoided.

In *kewda* (*Pandanus odoratissimus* Linn. f.), only the male flowers are used for distillation. The aroma is concentrated in the stamen and spathes covering them. It takes nearly 14 days to transform from bud initiation to a mature flower and the aroma is emitted for 12 to 24 hrs. The mature flowers are harvested early in the morning as with the increasing intensity of sun light the aroma fades out. The buds do not have any aroma and are thus not suitable for distillation. During the study, Ganjam district of Orissa state was surveyed. Today, more than 117 traditional distillation units are established in 200 villages / hamlets of the district. *Pandanus odoratissimus* Linn. f., (*kewda*) has a tropical distribution spread all over India, but luxuriant growth is concentrated in Ganjam district. In Ganjam district, *kewda* population grows in about 5000 ha of area and about 35 million (3,500 t) flowers are processed every season yielding essential oil. Ganjam district of Orissa supplies about 85-90% of country’s *kewda* essence\(^4\).

**Methodology**

*Kewda* flowers are processed by the traditional water distillation of copper stills/cauldrons/deg\(s\) (Fig. 1). The deg\(s\) are principally of three types to hold 400, 500 and 1,000 flowers, respectively. The most popular size is the 500 flowers capacity. They are ellipsoid in shape with about 100 cm diameter and 60 cm depth. The top portion has a central opening of

---

*Corresponding author.*
about 35 cm diameter to which a neck of 15 cm height and a 5 cm flange is attached. The deg is made up of copper sheet of 6 mm thickness. The bhābka is a round bottom spherical copper vessel of about 10, 15 & 20 L capacity (Fig. 2). The opening of deg is covered with a lid called Sarpos, which is provided with a 35-40 mm opening for the perfume vapour and steam to pass through (Fig. 3). Sealing at the lid is provided with local plastic clay mixed with cotton or jute fibre. The sarpos is designed in a manner to prevent any clay or sealing matter from going inside the vessel. It is kept in the tight position by means of a leaf spring called, Kamani to prevent the lid from being blown off when the pressure increases on heating.

The still is connected to a copper receiver known as Bhabka through a connector called Chonga (Fig. 4). The chonga, made up of bamboo is an angled bend pipe of 35 mm OD & 12-15 mm ID and consists of two pieces. The vapour up take pipe of about 40 cm long inserted in the sarpos is connected with another bamboo pipe of 1.5 m long with an angle of 60-70° bend. The two pipes are put together by cutting them obliquely; joining them face-to-face and are tied tightly with a rope to avoid leakage. The entire length of Chonga is covered closely with the grass rope (6-7 mm diameter) to provide insulation. The nodes in the bamboo are punctured so that the bamboo functions like a pipe. The end of Chonga is inserted in the bhābka and is provided with a 12-15 cm long wooden conical peg that fits snugly in the neck of the bhābka at about 15-20 cm from the end. The peg is covered with dry cotton cloth to provide sealing. The bhābka is a round bottom spherical copper vessel of about 20 L capacity. Smaller bhābka of 10-15 L are also used. The bhābka has a 30-45 cm long neck to facilitate inserting of chonga and sealing of mouth tightly. The bhābka kept in an inclined position in the brisk tank is held in the position by means of wooden cross bar and is prevented from floating up when the tank is filled with cold water. At a height of about 12-15 cm from the bottom of the bhābka, a small hole of about 10 mm diameter is provided to which a nut is welded. By tightening or loosening a bolt, it is possible to either completely close the hole or drain the bottom layer of water at the desired flow rate. At the beginning of the every distillation season, bhābka are heavily tinned inside to prevent the copper from reacting with kewda oil and vapour. Here, bhābka serves dual functions of condenser and receiver in the deg system of distillation (Fig. 7). The water tank, in which the bhābka is immersed for cooling is made of brick masonry of 1.2 m × 1.2 m × 1.2 m size and is provided with inlet and outlet for water circulation and with holes on the side walls for fixing the wooden cross bar to prevent the empty bhābka from floating (Fig. 5). The furnace or the bhatti is made up of bricks and clay and is not provided with any chimney. Smoke goes through the same opening provided for firing the wood.

Results

The flowers are distilled for two types of products the essential oil/rooh/absolute and the attar, which is obtained by absorbing the hot vapour of the kewda flower in to sandal wood oil or paraffin oil or di-octyl phthalate base. Production of essential oil is carried out during rainy season since it is the peak season; the ambient temperature is low and better recovery of oil is obtained. During the hot days, generally attar production is carried out. The better quality essential oil is obtained when 300–350 flowers are processed and better quality attar is produced when 800-1,000 flowers are processed.

For the production of rooh 400 to 500 flowers are charged into the deg and 60 L water is added. The flange portion of the deg is applied with a thick paste of a mixture of plastic clay or cotton or jute fibre. The chonga is then inserted into the 35 mm opening and kept in position so that the bhābka can be fixed at the other end. The bhābka kept in the empty tank in an inclined position is connected to the chonga to receive the vapour and condensed liquids. At this stage, plastic clay paste is applied at the sarpos-chonga and chonga-bhabka connections to block any possible leak. Now, the system is ready for starting distillation. For heating the still it takes 45 min. Then, it is heated on a low fire so as to distill about 5-6 L in the next 45-60 min. During the process of distillation, a worker sits inside the water tank and continuously rubs the receiver for better heat transfer from the condensate by keeping the cooling water agitated. The first distillate collected, called Agadi is kept for the next days oil separation. The distillation is again continues for about 1-1.5 hrs and collected 5-6 L of distillate, is called Pichadi. Again, the bhābka is replaced by a third one and distillation continues for 2-2.5 hrs to get 15 L of third distillate, called Tichadi. Next day, from the first and second distillates kept in an inclined manner water is removed out carefully without disturbing the oil. Then, the residual is transferred into a glass-separating funnel and the oil is
Fig. 1- *Deg* containing *Kewda* flowers

Fig. 2- Different types of *Bhabka*

Fig. 3- *Sarpos* is being fitted on *Deg*

Fig. 4- Arrangements of *Chonga*

Fig. 5- Oil cooling and *attar* production

Fig. 6- Oil and water being separated by separating funnel

Fig. 7- Sketch diagram of traditional distillation system
separated out (Fig. 6). In this process, \textit{Agadi} gives 8-14 gm, \textit{Pichadi} gives 3-4 gm and \textit{Tichadi} gives no oil. The water distilled from the cycle is used for the next batch operation.

Attar is made by absorbing perfume vapour into base oil; the most preferable is the sandal wood oil. This oil is perfect medium for such dilution as its soft rich and deep woody notes blends perfectly with any oil. In order to make the \textit{attar} cheaper, liquid paraffin or di-octyl phthalate (DOP) are used as fixative, which is also known as base oil. Usually, the vapours of \textit{pichadi} are absorbed into sandal wood oil and that of \textit{tichadi} in liquid paraffin or DOP till the original smell is not perceived. About 5 kg of base oil is taken in \textit{bhabkas} for each batch of operation and at the end of each distillation, water is separated in the usual manner. After the base oil gets the desired odour, it is used for absorbing vapour from 5,000, 10,000 or 25,000 depending upon the demand. The standard is the 10,000 flowers distilled into 5 kg of base oil. The essential oil is prepared from the fresh flowers where as the attar is prepared from both fresh and non-fresh flowers.

\textbf{Conclusion}

Though, new technologies have been developed, till today the traditional distillation system is popular in our country. For the distillation of \textit{kewda} essential oil and \textit{attar}, the traditional system is considered as best one and the products have high market value. Since, the method is convenient and cost effective people prefer this distillation system.

\textbf{Acknowledgement}

Authors are thankful to Department of Biotechnology, Government of India for providing financial assistance to carry out the research activities and Prof Vibhuti N Misra, Director, Regional Research Laboratory, Bhubaneswar for providing necessary laboratory facilities. Authors are also thankful to \textit{kewda} Distillers Association and \textit{Kiya Phula Samiti} of Ganjam district for helping in getting the detail information.

\textbf{References}