

Variation in the oil content in different parts of clove bud and from different geographical regions

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Abstract

This study determined the difference in oil content from separated parts of clove buds, full bud with crown, clove bud without crown and dust (stamen and style), and only crown along with dust from market sample. Results showed that the highest oil content in clove bud without a crown. Oil yield varied in clove buds from different geographical regions wherein, Madagascar showed the highest amount of oil.

Keywords: clove, essential oil, geographical variation, oil yield

Syzygium aromaticum (synonym: *Eugenia caryophyllus*), also known as clove, is a Myrtaceae family tree that is native to the Maluku Islands in eastern Indonesia. The trade of cloves and the desire for this valuable spice has driven the economic growth of this Asiatic region for ages. (Kamatou *et al.* 2012). Clove trees are commonly cultivated in coastal regions at a maximum altitude of 200 meters above sea level. Clove buds are the main marketed component of this tree. Four years after planting, plants start flowering. Before flowering, clove buds are harvested throughout the maturation phase. The collection could be done manually or mechanically (Oliveira *et al.* 2009).

The location, the harvesting season, the

environmental factors associated with the growing site, and of course, the genetic background of the plant all have an impact on the essential oil yield of aromatic plants (Haro-González *et al.* 2021). Madagascar, Indonesia, Malaysia, Sri Lanka, India, and Tanzania, especially the island of Zanzibar and Comoros, are now the major clove producers (Cortés-Rojas *et al.* 2014). Around 2,000 tonnes of oil is produced annually with a gross market worth of US \$ 30-70 million due to its use as a flower and aroma element as well as an antibacterial agent (Kamatou *et al.* 2012).

Following work was initiated at Institute of Chemical Technology, Mumbai, India in the year 2021 and the material (clove buds) procured from Madagascar, Indonesia, Sri

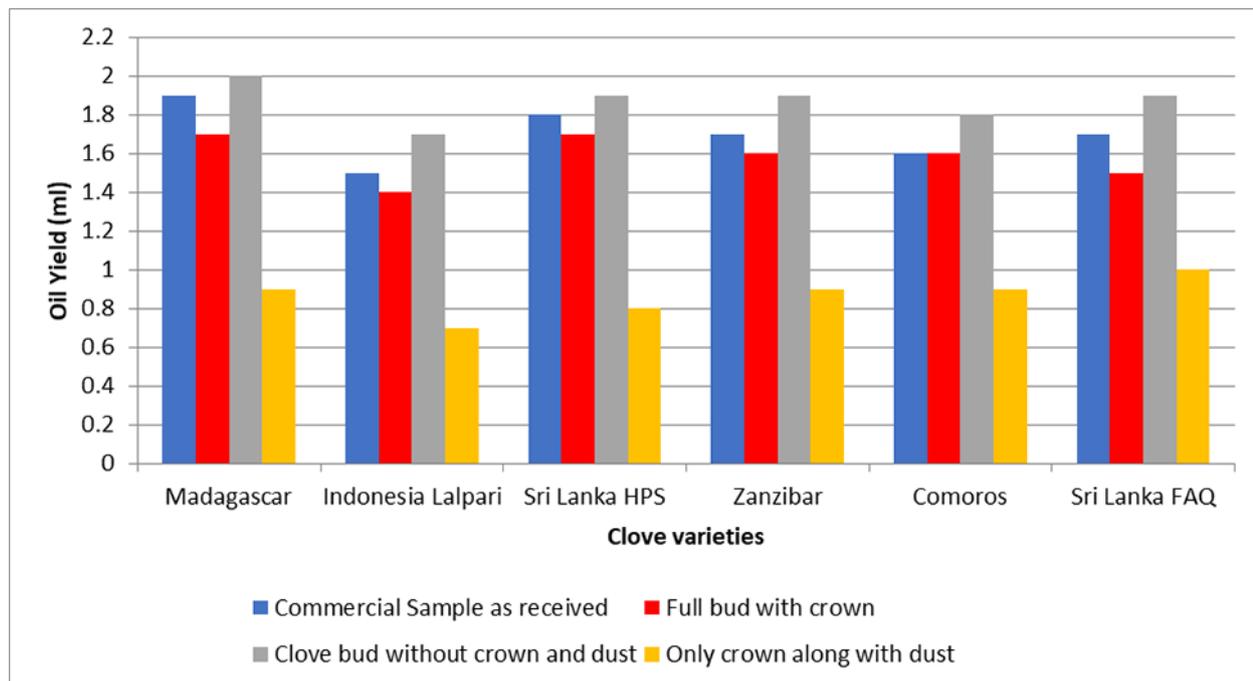


Fig. 1. Oil yield in different parts of clove buds collected from different regions.

Lanka, Zanzibar, and Comoros supplied by Komal Exotic Spices (KES), India, was used without any further processing.

Clove buds were stored at room temperature before use. Samples from each country was categorized into four parts (i.e., A: Commercial sample as received, B: Full bud with crown, C: Clove bud without crown and dust (stamen and style) and D: only crown along with dust (Alfikri *et al.* 2020). Ten gram of each sample was accurately weighed and ground by adding 20 ml of water in blender before subjecting to hydro distillation (Clevenger apparatus) (Jirovetz *et al.* 2006). Prior to the addition of the ground sample, 500 ml of water was distilled in RBF (Round Bottom Flask) (2000 ml) using xylene (2 ml) as a trap solvent for 30 minutes wherein xylene was added from the side tube (Guan *et al.* 2007). Later, the sample was added and hydro-distillation was carried out for 4 hours until two consecutive readings taken at 1 h intervals showed no change in oil content (Ben Hassine *et al.* 2021). Distilled clove oil will solubilize in trap solvent and form the upper layer. The system was allowed to cool down and the yield of clove oil was noted by

subtracting the volume of xylene from the total volume of the organic layer in the trap.

The experiment was replicated three times and average of three readings is reported in the study. In total, six varieties of cloves were used in the study. These varieties are Madagascar, Indonesia Lalpari, Sri Lanka HPS, Sri Lanka FAQ, Zanzibar, and Comoros. The results showed that oil content ranged from 7 to 20 % v/w with the highest in the Madagascar variety followed by Sri Lanka, Zanzibar, Comoros while Indonesian variety showed the lowest oil content (Fig. 1).

Clove bud without crown and dust (Stamens and style) of Madagascar variety showed the highest oil content (20% v/w). On the other hand, a crown region comprising of corolla, stamens, and style showed the lowest oil content.

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