Morphology And Anatomy Of Flower Buds Of Syzygium Aromaticum(L.) Merril and Perry.
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ABSTRACT

Clove, Syzygium aromaticum(L) Merrill and Perry is one of the most ancient and valuable spice. It is a member of the family Myrtaceae. The Clove of commerce is its dried unopened flower buds. Cloves are used to enhance flavour of meat, rice and used in curry powders and masalas. Clove oil is used in perfumes, soaps etc. Cloves are anti inflammatory, anti oxidant, anti thrombotic etc. Main objective of the present work is to provide detailed morphology and cellular organization of the flower buds of Syzygium aromaticum. Transverse section of the flower buds shows three regions. Epidermis, cortex and columella. Epidermis is heavily cuticularised. Inner to the epidermis present schizolysigenous oil glands. They are large and ellipsoidal in shape. They are filled with oils. Inner to which present vascular bundles. The ground tissue of this region contains calcium oxalate crystals. Inner to which present aerenchyma and columella.

Key words: Clove, flower buds, morphology, spice, oil glands

INTRODUCTION

Clove, Syzygium aromaticum(L.) Merril and Perry is one of the most ancient and valuable spice. It is a member of the family Myrtaceae. The clove of commerce is its dried unopened flower buds. It is a native to Molucca island of Indonesia. The major clove producing countries are Indonesia, Tanzania, SriLanka, Madagascar and on a limited scale, India. In India it is grown in Kerala, Tamil Nadu, Karnataka, Andaman and Nicobar island Clove is a medium sized tree which grows to a height of 10-20m, that can grow up to 100 years or more. The bark is grey, the leaves are elliptical in shape and fragrant. The flowers are hermaphrodite with a fleshy hypanthium surrounded by sepals. The fruit is a purple drupe. Whole and ground cloves are used to enhance the flavour of meat and rice dishes and used widely in curry powders and masalas. It has been recognized as an effective anaesthetic for sedating fishes in research procedures.[1] Gargling with clove oil can also aid in sore throat conditions and bad breathe [2] Sesquiterpene, found in clove were also investigated as potential anti-carcinogenic agents [3]. The oil has many
industrial applications and is used extensively in perfumes, soaps and as a clearing agent in histological work. In addition cloves are antimutagenic[4], anti-inflammatory [5], antioxidant [6] antiviral [7], antithrombotic [8] and anti-parasitic[9]. Main objectives of the present work is to provide detailed morphology and cellular organization of the flower buds of Syzygium aromaticum.

MATERIALS AND METHODS.

Fresh mature flower buds of Syzygium aromaticum were collected from trees cultivated in Ponmudi, Kerala in the month of December 2018. Free hand sections with razor blades were prepared and stained with Toluidine Blue ‘O’, I2KI and Sudan III. Photographs were taken with Nikon binocular Eclipse- Niu model microscope and Nikon digital Camera.

OBSERVATION AND DISCUSSION

Morphology

In Syzygium aromaticum inflorescence is a terminal Corymbose, trichotomous panicle. They are shortly pedunculate and branched from the base, shorter than leaves (Fig.c). The number of flowers may vary from 3 to 50 [10]. Bracts and bracteoles are narrow, acute 2-3 mm long and fall quickly (Fig.a). The flowers are hermaphrodite. They are 1-2cm long consisted of lower solid stalk called hypanthium and upper crown or cap (Fig.d). Hypanthium is 1.0-1.5cm long and 5mm in diameter. It is sub cylindrical angled and tapering below. The hypanthium is green in the young bud flushed pink at anthesis and turns deep red after the stamens fall. The crown consists of calyx, corolla, stamens and style. The four calyx lobes are fleshy, triangular, slightly incurved and 3-4mm long (Fig.d). Corolla is dome shaped which is made up of four pale yellow coloured, imbricate, immature, membraneous petals. Stamens numerous (Fig.e). Filaments are nearly while and glandular. The outer stamens are longest and are 9-10mm in length and innerones 3mmlong. The anthers are pale yellow, ovate, opening longitudinally with a small pale brown, inconspicuous connective gland. The style is very stout swollen at the base, pale green gland dotted and about 3-4mm long the two celled, multi ovulate inferior ovary is embedded in the top of the hypanthium(Fig.f). After fertilization stamens and styles invariably fall. The lower part of the flower along with the calyx
develops in to a fleshy, a dark one seeded drupe. The sepals are reduced to triangular projections and this popularly known as ‘mother of clove (Fig.g)

Fig (a). Young Flower bud  (b). Different stages of flower buds  (c) An Inflorescence
(d) Single Flower  (e) Stamens  (f). Style  (g) Fruits
 (br- Bract, pe-Petal, se-Sepal, cr-Crown, hy-Hypanthium, st- Stamen, sty- Style)

**ANATOMY**

Longitudinal section of the flower bud passing through crown shows outermost underdeveloped petals forming a cap (Fig.h). A centrally located erect stiff style about 3mm in length reaching almost up to petals; and at the base, with nectar disc Numerous tetradelphous stamens are present. The filaments of each group adherent at the base and the bundles are opposite to petals. Anthers introse. L.S of the hypanthium, the solid portion lying below the ovary shows central spongy parenchymatous tissues and numerous oil glands near the surface[10]. Upper portion of this shows two loculi of inferior ovary containing numerous ovules with axile placentation. Calyx also shows numerous oil glands.
Fig.(h) L.S of flower bud stained with I₂ KI

(pe- Petal, st-Stamen, sty- Style, se- Sepal, ov- Ovary, oc-Oil Cavity, hy-Hypanthium )

Transverse section passing through the ovary and hypanthium region slightly differ from each other. T.S Passing through ovary region is spherical in outline and hypanthium region is somewhat four sided. Transverse section of the clove hypanthium below the ovary shows epidermis, cortex and columella(Fig.j). Epidermis is heavily cuticularised with straight walls in which occur ranunculaceous stomata. There are three different regions in the cortex. The peripheral region is composed of 2-3 layer of large, ellipsoidal, Schizolysigenous oil glands arranged in two or three inter mixed layers (Fig.k). The oil glands are ellipsoidal in shape and are filled with oil. Sudan III gave orange colour to oil drops (Fig.m). Cluster of calcium oxalate crystals occur in many of the parenchyma cells. Within the oil gland layer there is a zone of cells with somewhat thickened walls embedding a ring of bicolateral vascular bundles (Fig.n). The ground tissue of this zone contains of cluster of calcium oxalate crystals (Fig.o). The meristeles are enclosed in an incomplete ring of lignified fibres (Fig.l).

The middles region consist of one or two rings of bicolateral vascular bundles with few pericyclic fibers. With in the ring of vascular bundles is a zone of aerenchyma, composed of air spaces and columella (Fig.p).The ground tissue of columella is parenchymatous and rich in
calcium oxalate crystals. Stone cells are also seen in this region. In the outer region of columella is a ring of some 17 to 20 small rudimentary fibro vascular bundles [11]. Numerous sphaero raphides are present through out columella.

The hypanthium in the region of the ovary shows epidermis, oil gland layer and a ring of bicollateral vascular bundles (Fig.i). With in this is a zone of cells with strongly thickened cellulose wall. Bilocular ovary with central placenta and numerous ovules. The placentae are rich in calcium oxalate crystals

References


