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Pappus Structure in the Family Compositae- A Short communication

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ABSTRACT

Pappus is a modified calyx and which is found in the family Compositae. There are two views, regarding the origin of pappus, which are non-calycine nature and calycine nature of origin. The first view was proposed by Small (1919).This view was partially adopted by Sattler (1973).The almost universally accepted view is that the pappus is calycine in nature, i.e., a modified calyx. It is generally considered that the pappus plays an impoftant role in the dispersal of the one-seeded dry fruits, called achenes or cypselas. The pappus is a taxonomically important and useful organ in Asteraceae, as noted by many synantherologists including, of course, Cassini (1827). Pappus is often persistent, but a deciduous or caducous pappus exists in many studied taxa of the tribe Cardueae and a few other genera (Sonchus,Bothriocline, etc,). Pappus may be homomorphic or heteromorphic, but the latter type is predominant in Cardueae, Lactuceae etc. Pappus may be barbellate, plumose, scaly, sitae, awn like etc. Length of pappus bristles varies from taxon to taxon and within taxa, and also within a single floret.So, in general, this feature is less important, but may sometimes be employed for separation of taxa (e.g., Arctotis, Berkheya, etc.). Structure and arrangement of pappus elements in a particular species are more or less stable and definite and the basic pattern is not much determined by external factors of environment. Morphological variations of pappus are nearly constant at generic and, to some extent, up to tribal level too. In true sence, pappus is absent in the tribe Calenduleae and some isolated genera in different tribes. Pappus bristles again can be divided into four categories, viz. capillary barbellate, scabrous barbellate, plumose and subplumose. Among them scabrous barbellate type of bristles are more prevalent in major tribes. Pappus bristles are absent in Anthemideae and Heliantheae. Scales and awns are restricted in Heliantheae and Inuleae. Coronate or border like pappus is found in some Anthemideae and some Inuleae. Extremely rare case, pappus is constituted by "Twin hair" like scales as seen in Brachycome or pappus form a tube like structure in Helipierum floribundum. It may be conspicuously heteromorphic in different tires of same species.The role of pappus structure in different tribes has been discussed on the view point of evolutionary aspect. A table is presented for different taxa to elucidate its exomorphic nature. Since pappus characteristics are ultimately controlled by genes, they are diacritical for taxonomic distinction at or below the tribal level along with other associated vegetative and floral features.

INTRODUCTION

As mentioned in the above, most recent workers have adopted the view that the pappus is a modified calyx, e.g., Cronquist (1977), Thorne(1983) and Takhtajan (1997). The pappus is a classical source of taxonomic information at the generic and specific level but less at the higher levels. According to the observation of Roth (1977), the pappus structure may be considered as reduced or less differentiated forms of foliage leaves, with undifferentiated or sclerenchymatous mesophyll tissue and reduced vascular system. The morphological features of pappus element has a great taxonomic significance specially at the tribal level (Judd et al., 2002). It may be persistent or caducous. Pappus elements may be five, few or numerous in number and usually without having any vascular tissue. It is oriented either in one or more rows but the mode of arrangement of pappus is more or less constant for each species. It exists as a crown at the apical part of the inferior bicarpellary, unilocular, uniovulate ovary. The pappus is a chief source of taxonomic information at the generic and infrageneric levels, but it also plays diacritical role in few tribes although the structure of pappus greatly varies in different taxa. Cronquist (1955) has mentioned that the five chaffy pappus is most primitive. Pappus may be persistent or caduceus and helps in dispersal. The dispersal and the movement of the pappus in response to humidity or air-current were early reviewed by Taliew (1895), Small (1919) and later by Ridley (1930). Usually brief features of pappus elements have been included by several taxonomist during the floristic studies of the family or infrafamilier analysis, monographic or revision of taxa of Asteraceae. Pappus feature has immense value along with other exomorphic features, which can be employed for proper recognition of taxa.

Pappus elements has some function, which are as follows:

1. Pappus plays an impoftant role in the dispersal of the one-seeded dry fruits, called achenes or cypselas.
2. Pappus structures can be involved in other dispersal mechanisms, such as zoochory.
3. Another function of pappus structure is protection against predation on the fruits or ovaries, as discussed by Stuessy & Garver (1996).

Pappus elements have been usually accepted as a modified calycine nature which are said to be important element for dispersal of the specialized one seeded fruit, commonly termed as 'Cypsela' or Achene' (Wagenitz, 1976). Pappus elements may be greatly variable within the tribes, but somehow identical in different species of a genus. Pappus may be homomorphic or heteromorphic. It may be distinctly heteromorphic in *Athrixia, Helipterum australe, Inula, Pulicaria, Erigeon, Tithonia.* Pappus elements are sometimes represented by minute ring or corona, which are mainly of two types, i.e. i) Non cupular coronate ring *(Brachycome paruula, Buphthalmum* and *Myriactis)* and ii) Cupular coronate ring *(Anacyclus, Anthemis, Chrysanthemum, Cosmos, Echinacea, Matricaria, Pulicaria* and *Tanacetum).* Pappus elements are also represented by setae, scales and awns. Setae could be divided into plumose type *(Helipterum australe)* and non plumose type *(Gaillardia).* Similarly scales may be of four types i) paleaceous scales *(Rutidosis);* ii) non paleaceous scales *(Helianthus);* hi) cartilaginous stiff twin hair like scales*(Brachycome)* and iv) multicellular hair like scales *(Helipterum australe).* Awns can be categorized into i) Awns with upwardly directed marginal barbs *(Tithonia)* and ii) Retrorsely barbed awns *(Bidens* and *Glossogyne).* Later type is specially restricted in the tribe Heliantheae. Length or height of the pappus elements varies from species to species and usually overlaps with one another. Colour of pappus elements usually varies from white-yellow-pale yellow-yellowish brown. Pappus is a genetically controlled permanent feature of a taxon. Therefore, it may be employed for characterization of taxa. Pappus feature is usually variable above the level of a genus and its size is also variable in relation to ecological conditions where it grows. Pappus with numerous bristles are said to be the most primitive from the evolutionary point of view as stated by Small (1918), Robinson (1981) and Bremer (1987) .

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