Reverse polarity in *Nauclea orientalis*, L.  
*(Sarcocephalus cordatus, Miq.)*

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**Abstract**

Embryo sac development conforms to Polygonum type. Starch grains are noticed in the embryo sac right from the megaspore mother cell stage. Twin tetrads one with a chalazal functional megaspore and another with a micropylar functional megaspore have been noticed in some ovules. While 75% of the embryo sacs have normal polarity, 20% of the ovules reverse polarity has been noticed. In the remaining 5% of the ovules, 'bipolarity' has been observed. Reverse polarity in relation to double archegoniate theory has been discussed.

1. **Introduction**

The embryo sac of angiosperms is generally characterised by the remarkable polarity it exhibits. The egg apparatus is organised at the micropylar end while the antipodals are formed at the chalazal end.

However there are instances of reverse polarity. Some of the earlier reports on reverse or inverted polarity include those of *Allium nigrum*, \(^1\) *Eriodendron aufruticosum*, \(^2\) *Rudbeckia bicolor*, \(^3\) *Wodferdia floribunda* \(^4\) and *Crinum asiaticum*, \(^5\) etc.

So far, there have not been any reports of reverse polarity in *Rubiaceae*. The present paper deals with the occurrence of reverse polarity in *Nauclea orientalis*, L., a tree belonging to the tribe *Naucleae* of the family *Rubiaceae*.

2. **Materials and Methods**

Flower heads of *Nauclea orientalis*, L. growing in Lalbagh gardens (Bangalore) were collected and fixed in F.A.A. Serial paraffin sections were cut at 8-10 \(\mu\), stained with Heidenheim's iron alum haematoxylin and counter stained with erythrosin.
3. Observations

The ovary is inferior with many pendulous ovules. The ovules are unitegmic and tenuinucellate. A single sypodermal archesporial cell differentiates in the nucellus and directly functions as the megaspore mother cell (figure 1). The megaspore mother cell undergoes reduction division and produces a linear tetrad of megaspores, of which the chalazal one is functional (figure 2). In about 5% of the ovules twin tetrads have been noticed. In one instance the ovule had juxtaposed twin tetrads, one linear and the other inverted ‘T’ shaped. In the linear tetrad the chalazal megaspore was functional and in the ‘T’ shaped tetrad the micropylar megaspore was functional (figure 3). In no case, however, twin embryo sacs have been noticed. The functional megaspore undergoes three successive divisions to form an eight nucleate embryo sac of the polygonum type. The egg apparatus is organised at the micropylar end and consists of two beaked synergids and a median egg (figures 4 to 6). Starch grains are found right from the megaspore mother cell up to the organised embryo sac. While the normal polarity characterises about 75% of the ovules, in 20% of the ovules reverse polarity is noticed. In these ovules the micropylar region consists of three cells which do not show any vacuolation and bear no resemblance to the egg apparatus. In the chalazal region a typical egg apparatus is organised with the usual characteristic features. In the chalazal egg apparatus also the synergids are beaked (figures 7 and 8).

In about 5% of the ovules, “Bipolarity” (i.e., organisation of egg apparatus at either ends) is noticed. Both egg apparatuses have beaked synergids (figure 9).

4. Discussion

In critically reviewing Porsch’s theory on the morphology of the embryo sacs Swamy\(^5\) opines that the cases of inverted polarity strongly support the double archegoniate theory and hence it should be accepted that the micropylar and chalazal quartets represent an archegonium each. He states that “though the instances of inverted polarity are sporadic, they are well distributed and cannot be without any significance”. He considers that the cases of reverse polarity are instances where the potential of the micropylar archegonium is suppressed. The non-fertilization of the chalazal egg apparatus\(^6\) is because of the distance involved between the point of entry of the pollen tube and the chalazal egg apparatus.

If one accepts Porsch’s theory, then it means that the vegetative tissue is totally eliminated from the embryo sac since the micropylar and the chalazal quartets represent an archegonium each. But it is rather difficult to accept

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