species *E. citriodora* (0.614 g/cm^3), *E. cloeziana* (0.556 g/cm^3) and *E. tereticornis* (0.529 g/cm^3) rank high in wood density. *E. cloeziana* is fairly uniform along the stem. Regarding fibre length, *E. cloeziana* (0.93 mm), *E. saligna* and *E. citriodora* (both 0.91 mm) are among the longest.

Comparison of gum affected and unaffected; and big and small trees. Gum or strictly speaking kino is present in the wood of almost all the *Eucalyptus* species in veins or pockets causing a degrade of timber. *Eucalyptus* species grown in Zambia have trees with varying degree of gum bleeding and deposition in the same plot. A direct comparison of affected and unaffected trees is possible to learn the effect of gum on wood density (Table II). The average density in gum affected trees is marginally higher than those of unaffected ones, but significant differences were present in *E. resinifera* only. Density in affected trees was higher in all discs and all segments than those of unaffected ones except at 15 ft in *E. citriodora* and at 25 ft in *E. cloeziana*. *E. saligna* seems to be an exception to the rule where the segments at three heights in unaffected trees have higher density than those of affected trees. There seems to be no relationship between the size of tree with the incidence of gum bleeding.

Except *E. resinifera* and *E. citriodora* the big trees have higher density than small trees but the difference is significant in *E. phaeotricha* only. The significant difference in big and small trees of same age of *E. phaeotricha* can be explained by the facts that 1. it shows a regular decrease in density from bottom to top and 2. in small trees the 15 and 25 ft levels are nearer the top than those in big trees so that the small trees will show lower values at the fixed height levels than the bigger ones. If on the other hand density goes on increasing from base to apex, the smaller trees should have higher density than the bigger ones as revealed by *E. resinifera*. For comparison purposes it is better to sample height as a percentage of the whole tree rather than assigning discs at fixed positions in the tree[4].

Résumé. La densité du bois et la longueur de la fibre ont été l'objet de recherches dans 8 espèces d'*Eucalyptus* de Zambie. Les espèces diffèrent considérablement par leur densité (0.487–0.614 g/cm^3), mais non par la longueur de leurs fibres (0.84–0.93 mm).

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Tapetal Development in the Anthers of *Allium sativum* L. and *Allium longicuspis* Regel

Allium sativum is an extremely variable species and has been grown as a crop plant for a long time. Central-Asiatic endemite *A. longicuspis*, differing from *A. sativum* by exserted anthers from the perianth, is thought to be the wild ancestor of common garlic[1].

A. sativum and *A. longicuspis* belong to the diploid species of the genus *Allium* with the basic chromosomal number $W = 8$[2–4]. A cytological investigation of *A. sativum* proved the striking karyotypical variability of various cultivars[5].

In both species the sexual reproduction is omitted, and bulbils are formed in the inflorescence besides the abortive flowers. The causes of pollen sterility are not yet clear and are explained by some authors as degeneration of the sporogenous tissue at different levels of anther development[6–8].

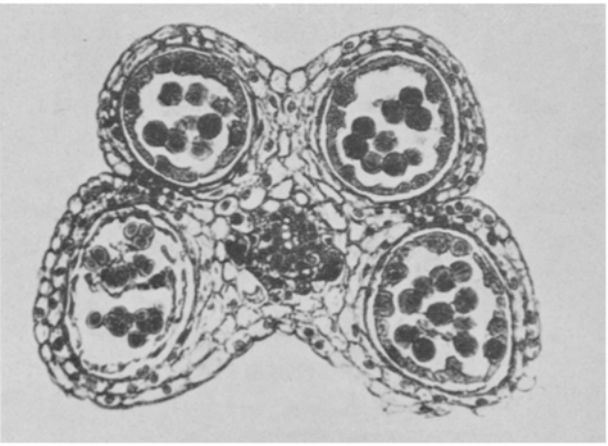

Fig. 1. The cross section of the anther of *Allium sativum* L. cv. 'Bzenecký paličák'. Pollen tetrads are surrounded by persisting tapetal layer. ×220.

But there were no data available about the development of tapetum – the innermost layer of the anther sac wall – through which the sporophyte affects development of the male gametophyte.

Materials and methods. The cloves of *Allium longicuspis* Regel were obtained from the Central Botanic Garden in Moscow, while the cultivar 'Bzenecký paličák' served for the trial with *Allium sativum* L. var. *sativum*. The anthers were sampled from the flowers at the praemeiotic, meiotic and postmeiotic stages of development. The objects were fixed in Carnoy's fluid and stained by means of modified orceine method without pretreatment.[9] The constant preparations were made of the anthers fixed in Navašin's solution. The sections 10 µm thick were stained by means of Cajal-Brožek's method in the saturated solution of basic fuchsine and picroindigocarmine.[10]

Results and discussion. The tapetal layer is differentiated at the praemeiotic stage of development from the parietal tissue of the anther sac wall. At the beginning of

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Fig. 2. The longitudinal section of the anther of *Allium sativum* L. cv. 'Bzenecký paličák' at the postmeiotic stage of development. ×220.

Fig. 3. The cross section of the anther of *Allium longicuspis* Regel at the postmeiotic stage of development. Uninuclear microspores are urrounded by hypertrophic tapetal layer. ×250.

meiosis, in both species *A. longicuspis* and *A. sativum* tapetum a single-layer row of the cells forms of isodiametric shape, surrounding the sporogenous tissue both from the outer and inner sides. In the course of zygotene and pachytene of PMCs, the intensive endomitoic processes take place accompanied by the structural change of the nuclei without visible coiling of chromosomes.

The tapetal cells keep uninuclear in most cases, binuclear cells with distinct nuclei can be seen only rarely. The course of meiosis of PMCs is quite normal, the homologues in pairs form 8 bivalents with 2–3 chiasmata of terminal type. The kinesis of the chromosomes in AI and AII is regular and at the end of the homeotypical meiosis the common wall of the tetrads is broken and the microspores are released into the cavity of the anther sac. In the course of meiosis, a continuous ring of the cells which surrounds dividing PMCs is formed by the tapetum. At the stage of the tetrads, individual anther sacs differ from one another by the quantity of persisting tapetal tissue (Figure 1). At the postmeiotic stage of development, the hypertrophy of the whole tapetal layer occurs in both species; the tapetal layer grows into the cavity of the anther sac (Figures 2 and 3). At this phase of microsporogenesis the abortion of microspores, which stop their development before the beginning of the first pollen mitosis, probably occurs.

A regular course of meiosis in *Allium sativum*, which has been recorded even by other authors[7,8], is closely connected with normal function of the tapetal protoplasts, the secretions of which take part, among others, in the precise synchronization of the reducing division of the sporogenous tissue in the anther sac. Similar situation in *A. longicuspis* gives evidence about close relationship of this species to the common garlic. In both species the pollen abortion occurs only at the postmeiotic phases of development.

The primary wrong cause of this phenomenon can be found in the false function of tapetum as the sporogenous tissue expressing by its hypertrophy.

In other words, the phenomenon of sterility is primarily realized at the sporophyte level and only secondarily expressed at the male haplophase level. Similar causes of the pollen sterility in Angiosperms are quite frequent and were also observed in connexion with cytoplasmic-genic male sterility in *Allium cepa*[11], as well as in the interspecific hybrids of some *Allium* sp.[12].

Zusammenfassung. Die Meiosis PMZ verläuft bei *Allium sativum* L. wie auch bei *A. longicuspis* Regel bis zur Bildung von einkernigen Mikrosporen normal. Dann unterbleibt die erste Pollenmitosis. Mit der postmeiotischen Pollenabortion hängt unmittelbar eine Fehlentwicklung der Tapetalschicht zusammen, die sich durch Hypertrophie manifestiert.

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