

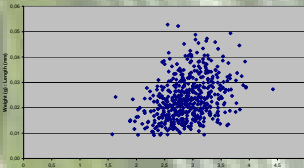
Enlightening the biology of *Spirematospermum*

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The investigation was initiated by a mass occurrence of fruits at the Ponholz site (Middle Miocene, Bavaria), which allowed to detect new insights into the biology of *Spirematospermum wetzleri* (Heer) Chandler

Variability of fruits



Independent Parameters: Relative biomass vs. form

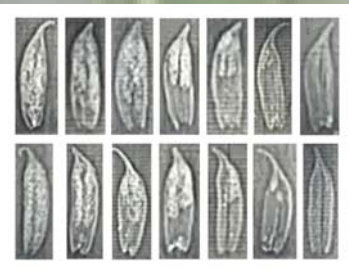
Despite high variability fruits represent one species



- Placentation was parietal, not axial.
- Note fruit abscission structure



Capsules opened by dry dehiscence



- Progressive seed dispersal (CT analysis)
- No closed fruits without seeds (510 fr., CT): fruit development dependent on fertilisation



Flower remnant proves inferior ovary typical for Zingiberales



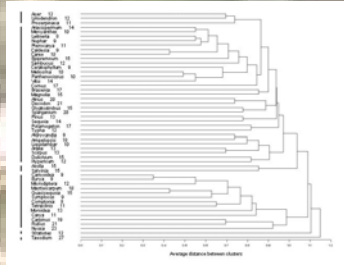
Courtesy H.-J. Gregor

Putative leaf (Oder II)

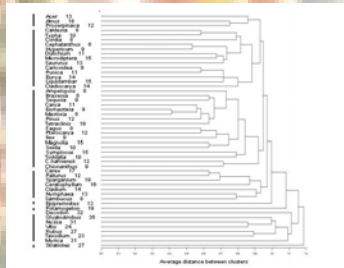


Putative rhizome (Ponholz)

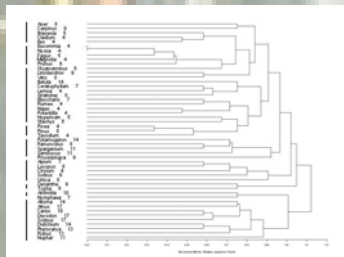
Plant associations by UPGMA cluster analysis



Oligocene (45 floras)



Miocene (51 floras)



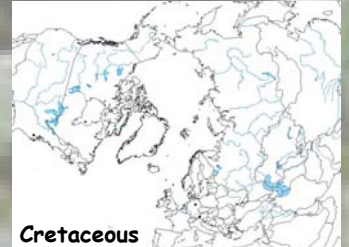
Pliocene (21 floras)

Conclusions

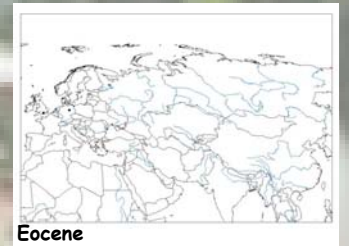
- Fruits are highly variable, but represent one species
- Flower remnant proves inferior ovary, typical for Zingiberales
- Placentation is parietal, not axial as described
- Fruit development was dependent on fertilisation
- Capsules were dry dehiscent
- Triple strategy for propagation:
 - Vegetative by rhizomes,
 - generative by seed dispersal and fruit abscission
- Association with leaves (*Z.ph. liblarensis*), rhizomes, pollen
- Systematic position within Zingiberales assured, family still to be identified or defined
- Plant associations demonstrate ecological flexibility, but also continuous water association
- Maximum abundance in the Miocene
- Cretaceous or Paleogene extinction in N America for unknown reason
- Pliocene extinction in Eurasia for climatic reason, migration hindered

Species	Number of specimens	Number of fruits	Number of seeds	Number of leaves	Number of rhizomes	Number of pollen grains	Number of other plant remains
<i>Spirematospermum wetzleri</i>	510	510	510	1	1	1	1
<i>Zingiberaceae</i>	10	10	10	1	1	1	1
<i>Liblarensis</i>	10	10	10	1	1	1	1
<i>Alps</i>	10	10	10	1	1	1	1
<i>Tibet</i>	10	10	10	1	1	1	1

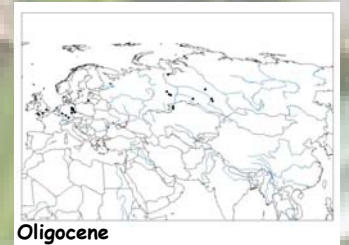
Paleobiogeography of the genus



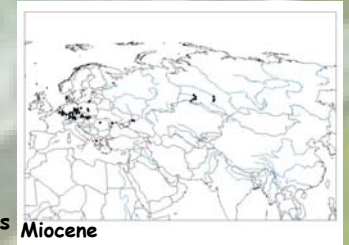
Cretaceous



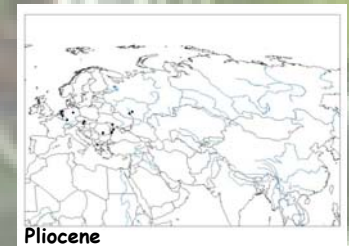
Eocene



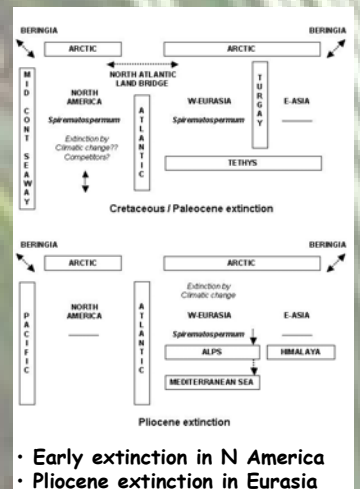
Oligocene



Miocene



Pliocene



- Early extinction in N America
- Pliocene extinction in Eurasia

Acknowledgement
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At the moment *Spirematospermum* can not be unambiguously affiliated to any extant Zingiberales family.