Regular variation in the size of vegetative buds, similar to that found for male buds, is demonstrated in ***Fig.*** 16. On February 2nd the mean length decreased in the sequence upper, mid-, lower and this permutation was found on each of the ten succeeding sampling dates. The probability of this result being obtained by chance is $(1/6)^{11} = 3.4 \times 10^{-9}$. In comparison with male buds, all vegetative buds began elongating on or about the same date, April 17th, in preparation for flushing.

***Picea sitchensis*** clearly differs from other spruces both in the size that vegetative and sexual buds reach before the winter and in the time that sexual and vegetative differentiation can be recognised. While in other spruces this differentiation is obvious before January, ***Picea sitchensis*** buds are extremely small (7 mm "external" length) at this stage and show no obvious differentiation. Observations of the internal morphology of buds reported here show that the type of differentiation can be recognised by mid-February. However, based on external morphology, this distinction cannot be made until mid — late March when there is a spurt of growth in the sexual buds preceding that which occurs in the vegetative buds. Finally, this work has also shown that bud size for both sexual and vegetative buds is strongly influenced by the level at which they occur in the crown. The higher a bud is placed in the crown, the greater its size. At present we offer no comment on the possible significance of this observation.


## Acknowledgements

This work was carried out while the senior author was in receipt of a N.E.R.C. research studentship. We would like to thank Dr. A. FLETCHER for his help during the course of this work.



## Summary

1. Observations on bud growth and differentiation were made on four 41-year old trees of ***Picea sitchensis*** growing at Roseisle Forest, Elgin, Scotland in 1973. In 1974 further studies were made on two of those trees.

2. In January the buds of ***Picea sitchensis*** are very small (about 6 mm long) and do not show obvious sexual differentiation.

3. By early February male buds can be recognised by a slight elongation to become cigar-shaped instead of pyramidal.

4. In mid-February female buds are distinguishable by the strobilus being tapered and filling the space enclosed by the bud scales in contrast to the leaf primordia of vegetative buds which are flat-topped and do not fill this enclosure. The scale pattern also differnetiates it from the vegetative bud.

5. External measurements of bud length show that male and vegetative buds cannot be distinguished on this basis until mid — to late March when the male buds have a spurt of growth.

6. The growth spurt of vegetative buds does not occur until mid — to late April.

7. Both male and vegetative buds are bigger the higher they occur in the crown.



Key words: Sitka spruce, bud differentiation, bud growth.



## Zusammenfassung

An vier 41jährigen Sitka-Fichten ***(Picea sitchensis*** (BONG.) CARR.) wurden in den Jahren 1973 und 1974 im Roseisle Forest, Elgin, Schottland, Untersuchungen zur morphologischen Veränderung der Knospen im Frühjahr durchgeführt. Hierbei waren im Januar noch keine äußeren Veränderungen gegenüber dem Winterzustand zu erkennen und auch keine Unterscheidung bezüglich des Geschlechts möglich. Anfangs Februar werden die männlichen Blütenknospen länger. Ab Mitte Februar sind die weiblichen Blütenknospen zu erkennen. Erst Mitte bis Ende April beginnt das Wachstum der vegetativen Knospen. Männliche und vegetative Knospen sind in höheren Kronenregionen stärker ausgebildet.


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# Some observations of the Flower biology of Ekebergia capensis Sparrm. (Syn. E. senegalensis A. Juss.)


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(Received November 1975)


## Introduction

The species ***Ekebergia senegalensis*** A. Juss. is recorded in the Flora of West Tropical Africa (KEAY 1958), Nigerian Trees (KEAY *et al.* 1964) and in Savanna trees of Nigeria (HOPKINS *et al.* 1966). Its distribution is stated as stretching from Senegal to Sudan and Uganda. Another closely related species ***E. capensis*** SPARRM. which occurs naturally in the South African Cape, spreads upwards into Uganda.

Recent intensive taxonomic studies of the two species by WHITE and UZOECHINA between 1971—72 (to be published) reveal that ***E. senegalensis*** and ***E. capensis*** should be merged into a single species. ***Ekerbergia capensis*** SPARRM. which is the earlier name is thus retained for the two species. ***E. senegalensis*** is thus sunk under ***E. capensis.***

After dissections and examinations of hundreds of flowers sampled from herbarium specimens collected from the

entire distribution range of the species in Africa, and deposited at the Forest Herbarium Oxford (FHO), Dr. STYLES and WHITE (1966) came to the conclusion that *E. capensis* was dioecious. Their criterion for a male flower and hence a male plant was presence of dehisced anthers with numerous pollen grains, occurrence of vestigial and elongated gynaecium. But a plant is female if flowers showed shrivelled anthers no pollen, bell-shaped gynaecium that is relatively very short style. STYLES (1972) confirmed that the sexes are on separate individuals.

During her study-leave at Oxford in 1972 the present writer also dissected two hundred and forty flowers taken from both pickled flowers and dried herbarium materials and after their examination also confirmed dioecism for *Ekebergia capensis*. This microscopic examination included that of the flowers collected from the single tree growing on the premises of Landscape unit in the Nsukka Campus of the University of Nigeria (UNH 26). In April 1973 by which time the worker had come back to Nigeria, few fruits were found on this same tree *Ekebergia capensis* (syn. *E. senegalensis)* which previous workers could have regarded as a male tree.

This significant observation raises doubt on the presently known dioecism recorded for the species. Thus followed intensified field studies on the plant during the period 1972—75.

Furthermore personal communication with Mr. F. WHITE of Oxford has indicated that so far, there is no comparable detailed observation and information on record, for the species.

## Field and Herbarium Studies

The tree of *Ekebergia capensis* SPARRM. growing by the Landscape premises of the University of Nigeria, Nsukka was observed monthly for flowering, fruiting and foliage activity over a period of three years. The search for other tree of *E. capensis* in the neighbourhood was unsuccessful.

Flowering twigs were pressed and voucher specimens deposited in the University of Nigeria Herbarium (UNH). Flowers were collected separately and preserved in specimen bottles containing 50/50 mixture of glycerol and absolute alcohol. Two hundred flowers randomly sampled from the crown of this tree were dissected and microscopically examined. The drawings of floral parts of the dissected flowers were made. Drawing of fruiting twig was done. A dried branch with fruit is kept as herbarium reference.

In the second and third year, more flowers were dissected for examination of styles and typical female flower.

Few ripe fruits were germinated both in wet petri dishes under laboratory condition and in pots containing garden soil and placed beside potting shed. Photographs of various stages including that of two years 3 months old seedlings were taken.

## Discussion

It is clear there are limitations in basing conclusions from observations made on a single tree from a single locality. Nevertheless, certain observations made here appear new for this species.

*Table 1* shows some yearly regular sequence in activities of the tree. Dehisced anthers with enormous pollen grains were observed on the flowers from this tree. Following the criterion for a male plant (presence of dehisced anthers with pollen grains, elongated style) this tree should have been regarded as a male. But the observation of viable fruits on the same tree is contrary to this view and sheds some doubt on the question of dioecism.

On the basis of present observation therefore, the concept of dioecism for this species requires clarification. It is here suggested that if dioecism is to be accepted, that a plant should be regarded as male or female depending on the functional sex organ in greater percentage.

The few but significant fruits formed suggest a possible andromonoecious condition of STYLES 1972 and which in this context means presence of unisexual and bisexual flowers on the same individual.

Furthermore, present observation can be one of such cases showing evidence of evolutionary tendency from dioecism to monoecism.

*Table 1.* — Phenological activities.

| Months | 1972 | 1973 | 1974 | 1975 |
|---|---|---|---|---|
| Jan. | — | New flush | New flush | New flush |
| Feb. | — | Profuse flowering | Flowering | Flowering |
| March | — | Dissected mature flowers with dehisced anthers, elongated style. | Dehisced anther observed | Fruiting |
| April | — | Few cream coloured fruits occurring sporadically | Few green fruits | Very few green fruits seen on same side as previous year |
| May | — | A ripe, red wine coloured fruit collected; rest green | Green fruits | Green fruits |
| June | — | Green fruits | Green fruits | Green fruits |
| July | — | Ripening of fruits | Fruits ripen | Ripe fruits collected |
| August | — | Tree dark green, in full foliage | Crown full of dark green leaves | — |
| Sept. | — | Tree dark green; in full foliage | | |
| Oct. | — | Full foliage | Full foliage | Full foliage |
| Nov. | Full foliage | In full foliage | Full foliage | — |
| Dec. | Tree is leafless | Tree leafless | Tree leafless | — |

**Acknowledgements**

The author wishes to thank Mr. F. White, Dr. S. S. C. Onyekwelu for supporting the observation and Mr. J. C. Okafor for reading through the manuscript.

**Summary**

Intensive observations made over a period of three years on a single tree of *Ekebergia capensis* Sparrm. (Syn. *E. senegalensis* A. Juss.) in Nigeria, have shown that the concept of dioecism in respect of this species needs clarification.

*Key words:* Ekebergia capensis Sparrm., Dioecism, Monoecism.

**Zusammenfassung**

Die tropischen Baumarten *Ekebergia senegalensis* A. Juss. (natürliche Verbreitung von Senegal bis zum Sudan und Uganda) und *E. capensis* Sparrm. (natürliche Verbreitung von Südafrika bis nach Uganda) werden heute als zu einer Art gehörig angesehen, die zweihäusig ist. Aus den vorliegenden Untersuchungen geht jedoch hervor, daß vom gleichen Baum sowohl Pollen erzeugt wird als auch Früchte mit keimfähigen Samen hervorgebracht werden können.

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# Note

### 4. North American Forest Biology Workshop

The Fourth North American Forest Biology Workshop will be held at the State University College of Environmental Science and Forestry, Syracuse, New York 9—11 August 1976. The following topics will be emphasized:

1. Hardwood Regeneration — Planting stock quality: How to define it and how to obtain it
2. Tissue Culture — Genetic and Physiological aspects
3. Physiology and Genetics of Pollution Resistance
4. Allelopathy — Physiology and ecology
5. Biological Modeling
6. Current Provenance Research — Physiological and Evolutionary Aspects

Voluntary papers on the above or related topics are welcome; abstracts will be published. Titles and abstracts should be submitted to one of the co-chairmen:

Hugh E. Wilcox
School of Botany and Plant Pathology
State University College of Environmental Science and Forestry
Syracuse, New York 13210

or David T. Funk
Forestry Sciences Laboratory
Southern Illinois University
Carbondale, Illinois 62901

# Buchbesprechungen

**Die Holzschäden und ihre Verhütung.** Leitfaden der Pathologie des Holzes und der Holzprodukte für Studium und Praxis. Von Prof. Dr. Werner Bavendamm. 1974. VIII, 136 Seiten. 50 Abb. mit 100 Einzeldarstellungen, 3 Tab., 170 Literaturzitate. Wissenschaftliche Verlagsgesellschaft mbH, Suttgart. DM 38,—.

Der Autor stellt in vorliegendem Buch die Krankheit des Holzes in den Mittelpunkt seiner Betrachtungen und führt hierfür den Begriff der Holzpathologie ein. Das bedeutet, daß wir hier kein Buch zur Bestimmung von Krankheitserregern oder Schädlingen an Holz und Holzprodukten vor uns haben, sondern eine „neue Zusammenschau botanischer und zoologischer, chemischer und physikalischer Erkenntnisse". Die Holzpathologie wird hierbei als eigenständige wissenschaftliche Disziplin aufgefaßt und deutlich vom Holzschutz getrennt. Eine Begriffsbestimmung gibt der Autor zu Beginn seines Buches im Kapitel „Stellung und Abgrenzung der Holzpathologie". Es folgt ein kurzes Kapitel zur Geschichte dieses Fachgebietes. Etwas zu kurz erscheint das Kapitel über Schadensursachen abgehandelt. Dagegen findet sich ein ausführliches Kapitel über die vielfältigen Schadensvoraussetzungen. Einem etwas allgemeinen Abschnitt über Schadensentstehung und Schadensverlauf folgen 3 Kapitel über die Schadensfolgen. Hierbei wird auf Veränderungen des Aussehens und der Struktur sowie auf Veränderungen der mechanischen, physikalischen und chemischen Eigenschaften des Holzes und der Holzprodukte eingegangen. Den Abschluß des Buches bilden Kapitel über wirtschaftliche und rechtliche Auswirkungen der Holzschäden und über Schadensverhütung und Bekämpfung der Schaderreger. In einem Anhang werden auf wenigen Seiten die für die Praxis wichtigsten pflanzlichen und tierischen Holzschädlinge erwähnt sowie spezielle phatologische Probleme der Praxis aufgezählt. Schließlich ermöglicht ein Literaturverzeichnis mit über 170 Zitaten ein weiteres Eindringen in die Probleme der Holzpathologie. Das Buch ist mit zahlreichen, instruktiven Abbildungen versehen. Insgesamt gibt dieser Leitfaden einen guten Einblick in die Holzpathologie und trägt zu einem besseren Verständnis der Zusammenhänge bei.

B. R. Stephan

**The genetic improvement of Pinus patula** Schiede et Deppe **in Rhodesia.** By R. D. Barnes D. Phil. thesis, University of London. 322 p. (1973).

It is always invidious to describe a report as "the best" but this is undoubtedly one of the most thorough and comprehensive doctoral theses on forestry to come from Africa. It represents many years' work by the research branch of the Rhodesia Forestry Commission and lays a firm foundation for future breeding. The results refer particularly to *Pinus patula* but the methods, interpretation and conclusions have considerable relevance for other species and countries.

Several of the chapters are being prepared for publication in Silvae Genetica and it is sufficient here to quote the author's abstract in full.

The Rhodesian *Pinus patula* population is based on a few small imports of seed. Forty years after the introduction of the species, a breeding programme of recurrent selection for general combining ability was initiated to improve various morphological and anatomical characteristics. Polycross, factorial and diallel mating plans were used in progeny tests designed to elucidate the genetic structure of the population, to identify the best general combiners, and to provide information on efficiency of mating and environmental designs. Statistical procedures for the analysis and genetic interpretation of assessments in the progeny tests were developed. The analyses indicated that, at the juvenile stage, five-tree plots would have been most efficient and that a triple lattice structure was of little practical value. A portion of the considerable variability expressed in most of 39 measured and derived nursery and