

Microbotanical signatures of *kreb*: differentiating inflorescence phytoliths from northern African wild grasses

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Supplementary Material 2: Classification keys for phytolith morphologies within inflorescence bracts.

Images of dissected components and *in-situ* phytoliths illustrate morphological variation according to anatomical distribution. Representative phytolith examples from the top, centre and base of each analysed inflorescence bract are shown for each species. Refer to the main article (Figures 4 and 5) for example images of individual phytolith morphotypes and characteristics of INTERDIGITATE phytoliths. Table 2 in the main article summarises the diagnostic morphotypes that occur within individual spikelet components for each species.

Chloridoideae

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Panicoideae

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***Dactyloctenium aegyptium* (L.) Willd**

Phytoliths were present in all analysed bracts, with SADDLE thin, ELONGATE DENTATE and ACUTE BULBOSUS morphotypes. Within the fertile floret, ELONGATE cells had more pronounced ornamentation with more CLAVATE type ornamentation towards the top of the florets.

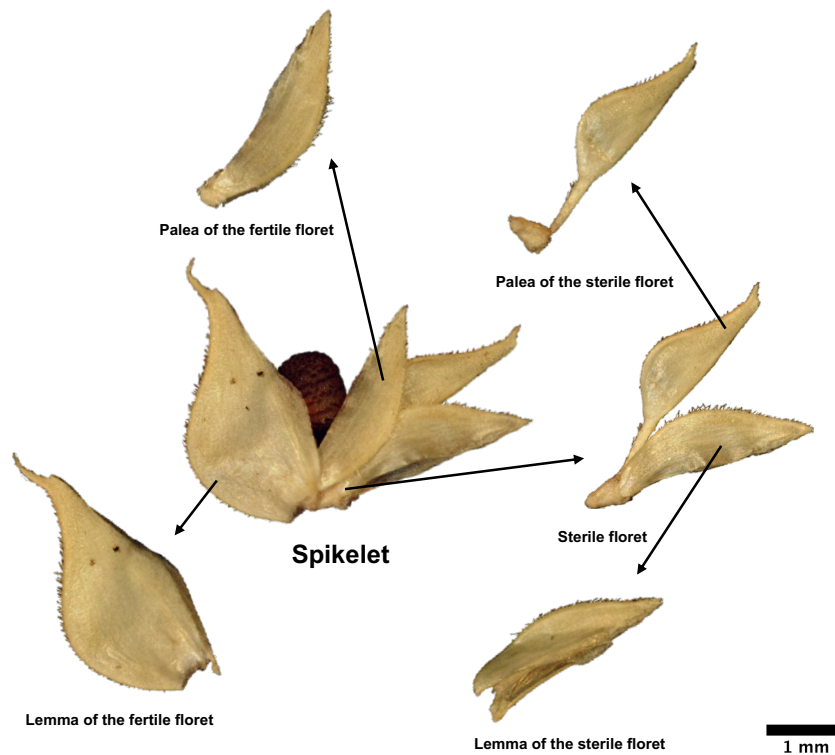


Fig. 1. Dissected *Dactyloctenium aegyptium* spikelet.

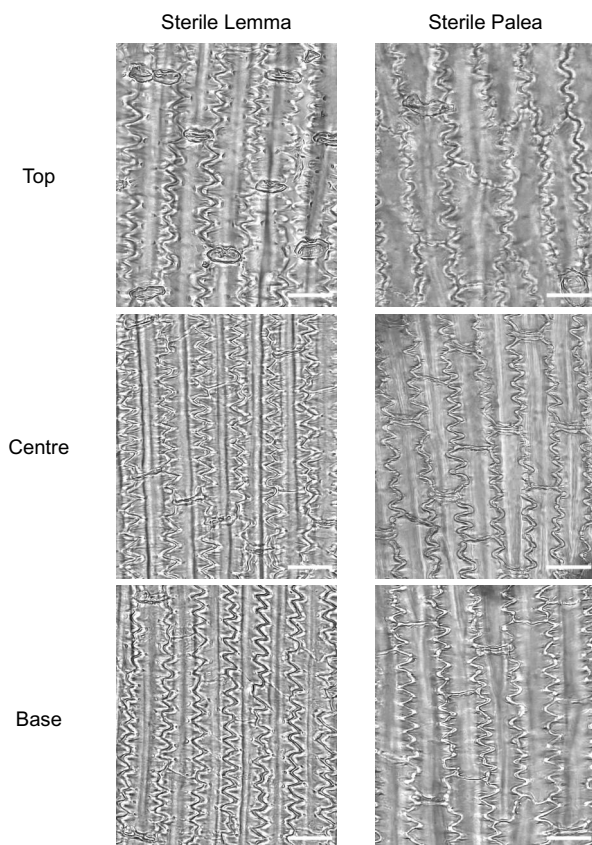


Fig. 2. Articulated phytolith classification key for *Dactyloctenium aegyptium* sterile floret. Characterised by SADDLE thin, ELONGATE DENTATE and ACUTE BULBOSUS phytoliths. Scale bar (20 µm) applies to all panels.

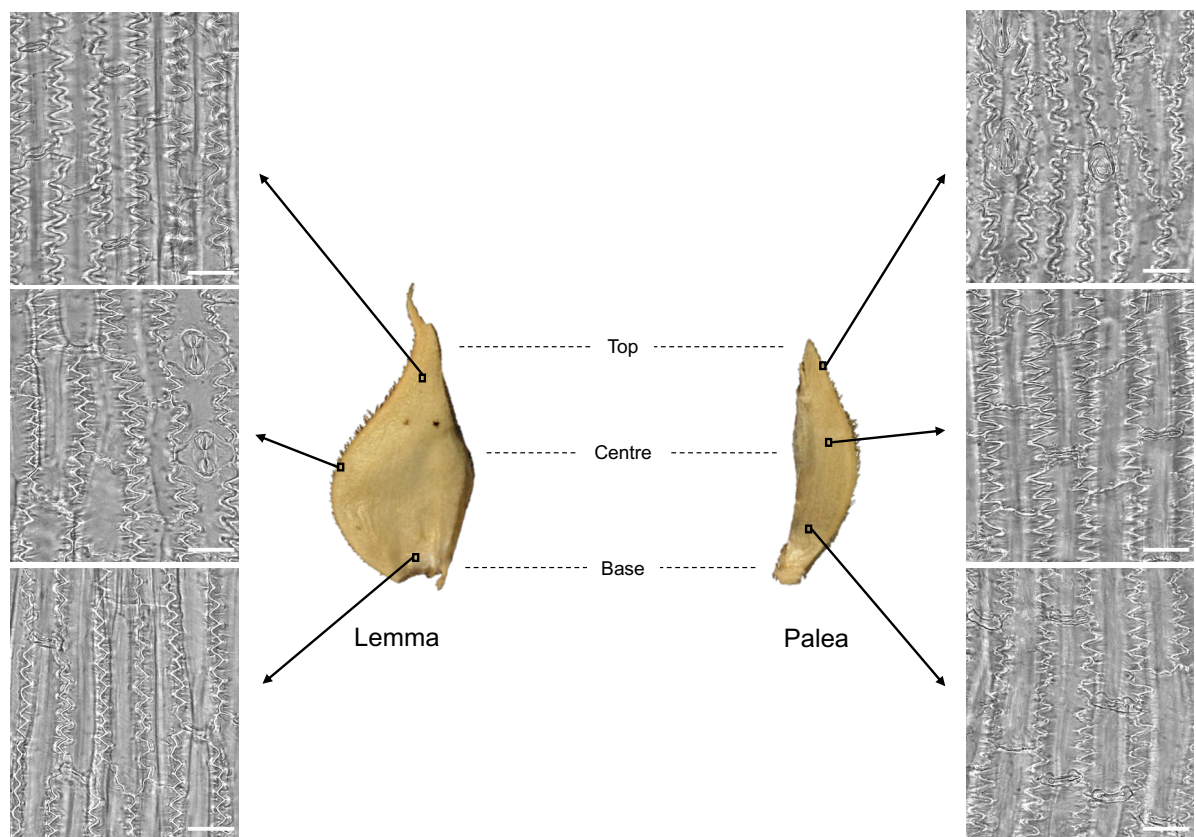


Fig. 3. Articulated phytolith classification key for *Dactyloctenium aegyptium* fertile floret. Characterised by SADDLE thin, ELONGATE DENTATE/CLAVATE and ACUTE BULBOSUS phytoliths. Scale bar (20 µm) applies to all panels.

Eleusine indica (L.) Gaertn

Phytoliths were present in all analysed bracts, with BILOBATE (short tabular convex lobes and trapeziform base), SADDLE squat, CROSS (arched 4 lobed), ELONGATE CLAVATE and ACUTE BULBOSUS morphotypes. Short cell morphologies in the fertile palea were predominately characterised by BILOBATE (trapeziform base).

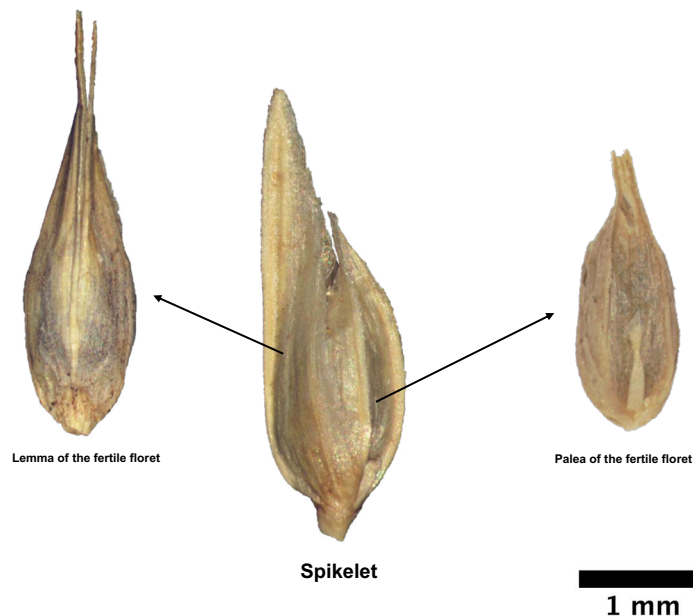


Fig. 4. Dissected *Eleusine indica* spikelet.

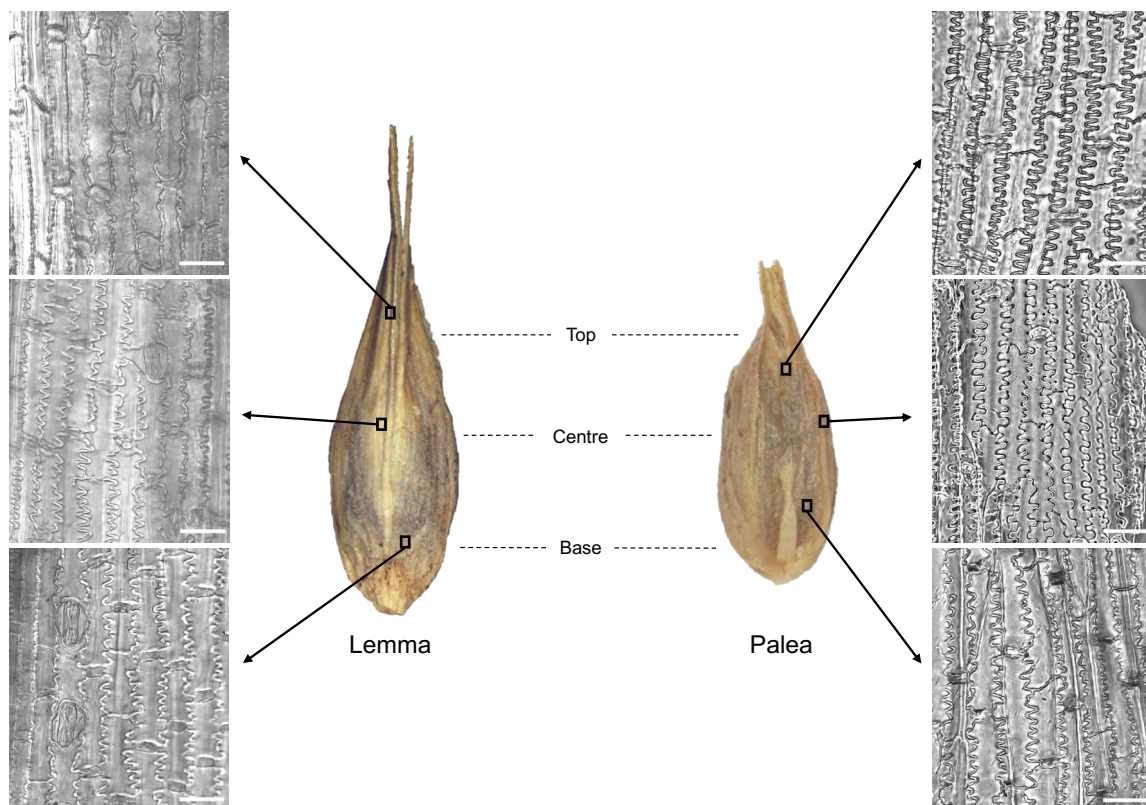


Fig. 5. Articulated phytolith classification key for *Eleusine indica* fertile floret. Characterised by BILOBATE (short tabular convex lobes and trapeziform base), SADDLE squat, CROSS (arched 4 lobed), ELONGATE CLAVATE and ACUTE BULBOSUS. Most BILOBATES within the fertile palea are trapeziform base morphotypes. Scale bar (20 μ m) applies to all panels.

***Echinochloa colona* (L) Link**

Phytoliths were present in all analysed bracts. The glumes and sterile floret were characterised by BILOBATE (short tabular concave and trapeziform base), CROSS tabular, ELONGATE CLAVATE/DENTATE and ACUTE BULBOSUS morphotypes. INTERDIGITATE morphotypes within the fertile floret were characterised by β -type level I – III undulations with PAPILLATE attached to the central cell body and ARTICULATE terminal margins. Level III undulations were only observed in the centre of the fertile lemma and palea. Level IV undulations were not present.

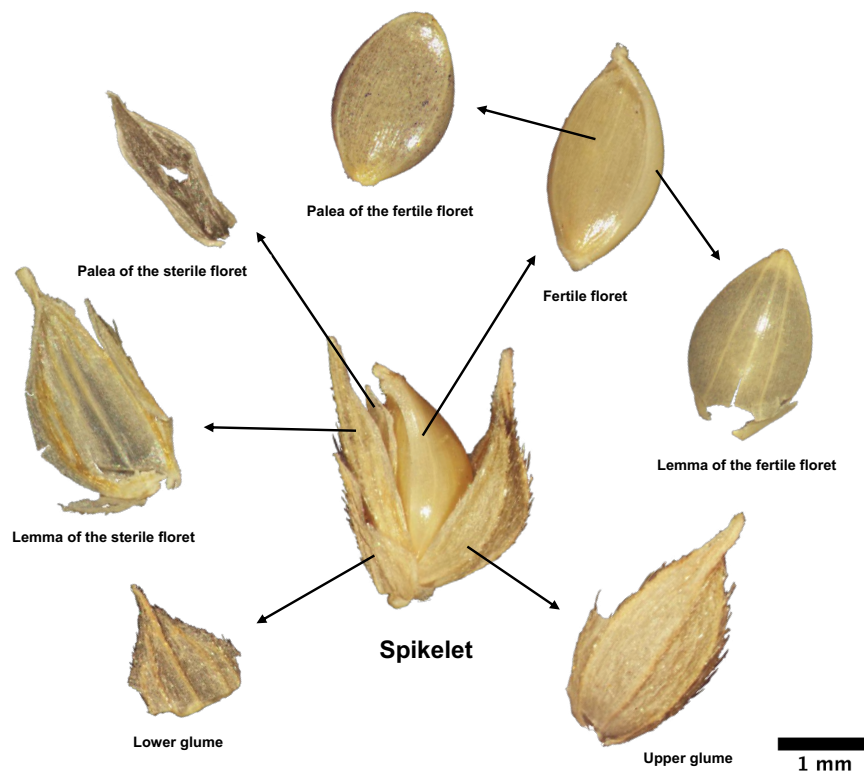


Fig. 6. Dissected *Echinochloa colona* spikelet.

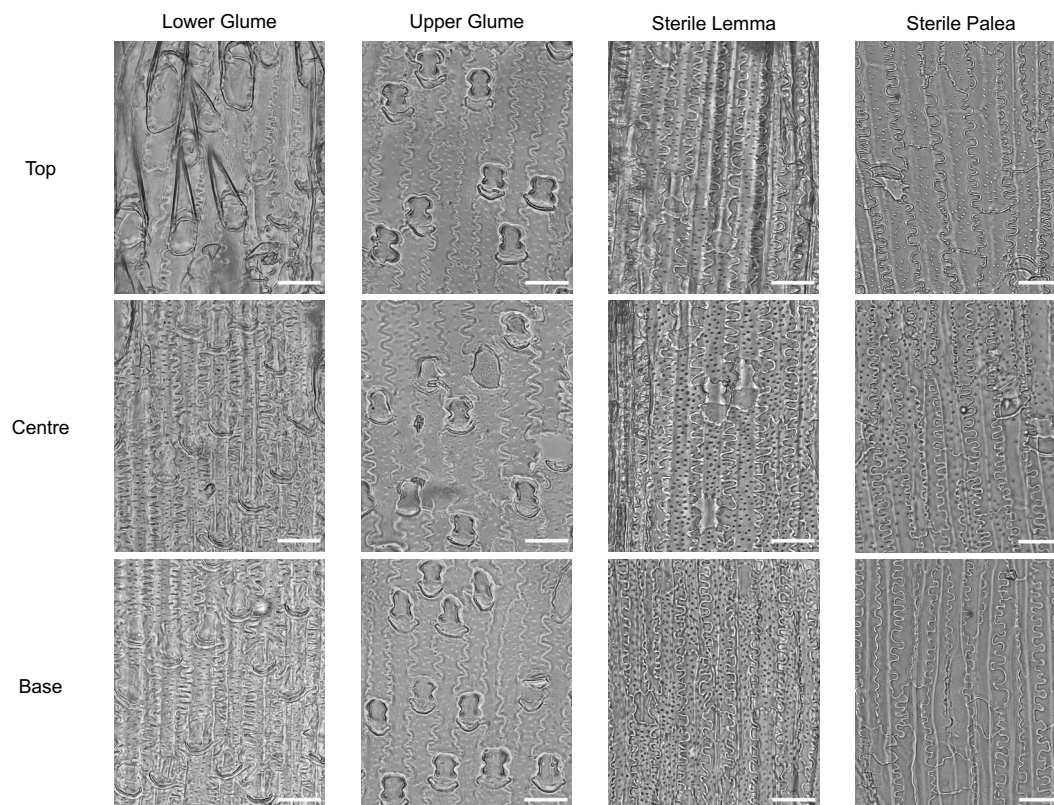


Fig. 7. Articulated phytolith classification key for *Echinochloa colona* glumes and sterile floret. Characterised by BILOBATE (short tabular concave and trapeziform base), CROSS tabular, ELONGATE CLAVATE/DENTATE and ACUTE BULBOSUS morphotypes. Scale bar (20 μ m) applies to all panels.

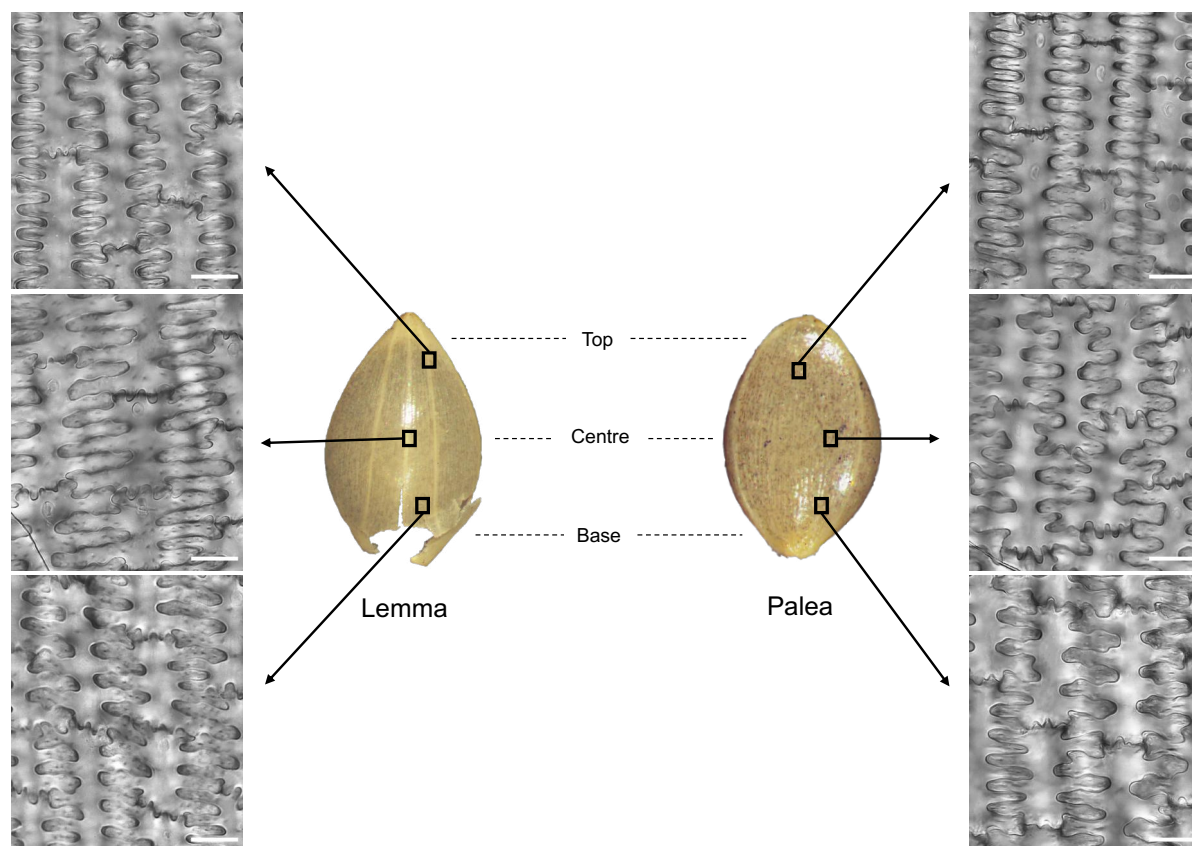


Fig. 8. INTERDIGITATE phytolith classification key for *Echinochloa colona* fertile floret. Characterised by INTERDIGITATE morphotypes with β -type undulations, PAPILLATE attached to the central cell body and ARTICULATE terminal margins. Scale bar (20 μ m) applies to all panels.

***Panicum anabaptistum* Steud**

Phytoliths were present in all analysed bracts. The glumes and sterile floret were characterised by BILOBATE (short tabular convex lobes and short tabular concave lobes), ELONGATE CLAVATE/DENTATE and ACUTE BULBOSUS morphotypes. INTERDIGITATE morphotypes in the fertile floret of *P. anabaptistum* were characterised by η -type level I undulations with slightly REPAND/SINUOLATE terminal margins. PAPILLATE cells were not present in the fertile floret.

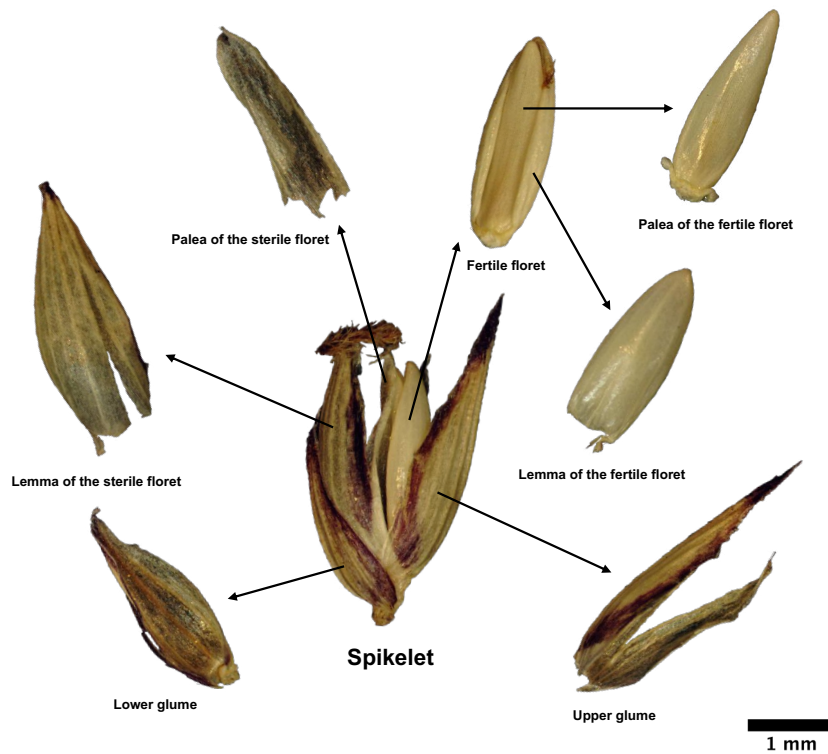


Fig. 9. Dissected *Panicum anabaptistum* spikelet.

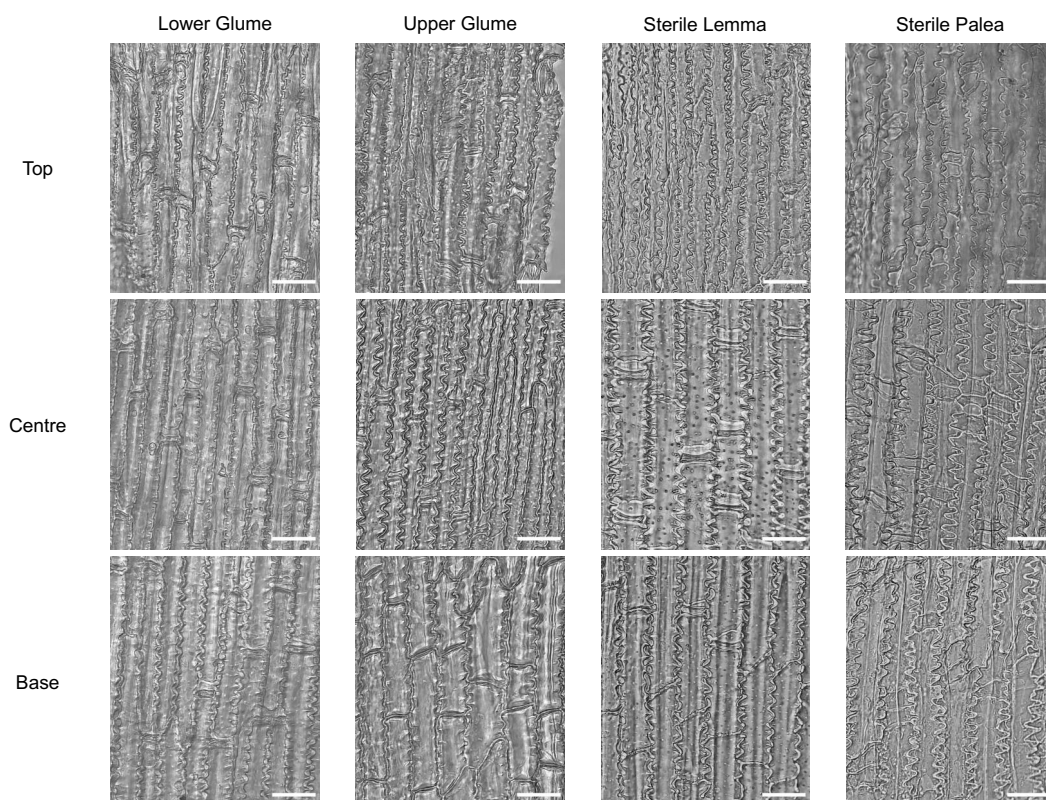


Fig. 10. Articulated phytolith classification key for *Panicum anabaptistum* glumes and sterile floret. Characterised by BILOBATE (short tabular convex lobes and short tabular concave lobes), ELONGATE CLAVATE/DENTATE and ACUTE BULBOSUS morphotypes. Scale bar (20 µm) applies to all panels.

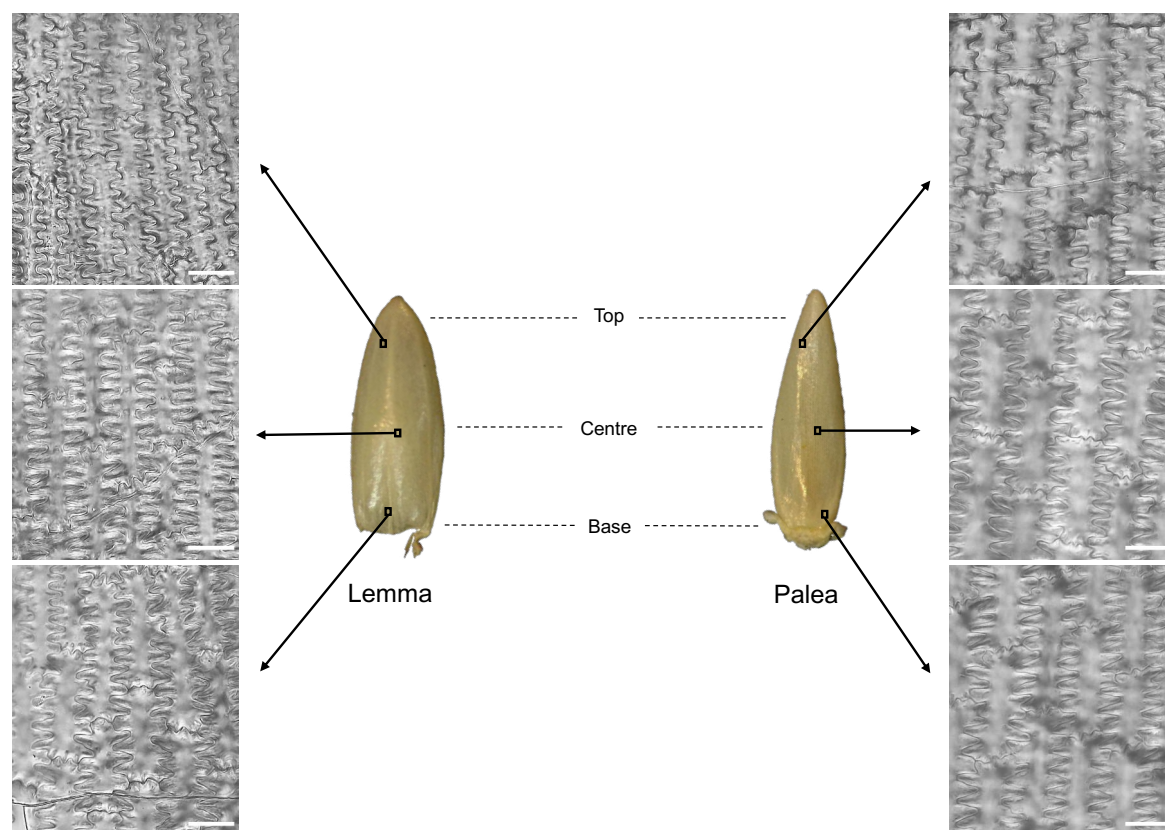


Fig. 11. INTERDIGITATE phytolith classification key for *Panicum anabaptistum* fertile floret. Characterised by INTERDIGITATE morphotypes with η -type level I undulations with slightly REPAND/SINUOLATE terminal margins. PAPILLATE cells were absent. Scale bar (20 µm) applies to all panels.

***Panicum laetum* Kunth**

Phytoliths were present in all analysed bracts. The glumes and sterile lemma were characterised by BILOBATE (short tabular concave lobes and short tabular convex lobes), ELONGATE CLAVATE/DENTATE and ACUTE BULBOSUS morphotypes. INTERDIGITATE morphotypes in the fertile floret of *P. laetum* were η -type level II – III with intricate ARTICULATE/BRACHIATE terminal margins. PAPILLATE cells were absent in the fertile floret. Weakly silicified INTERDIGITATE morphotypes with basic η -type undulations and PAPILLATE attached to the central cell body were observed in the sterile palea of *P. laetum*.

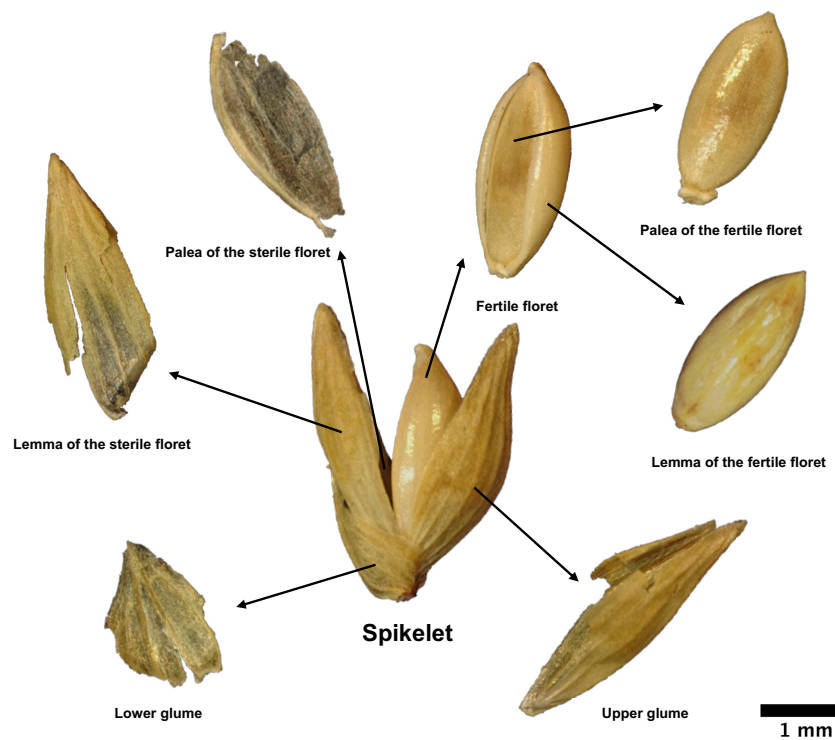


Fig. 12. Dissected *Panicum laetum* spikelet.

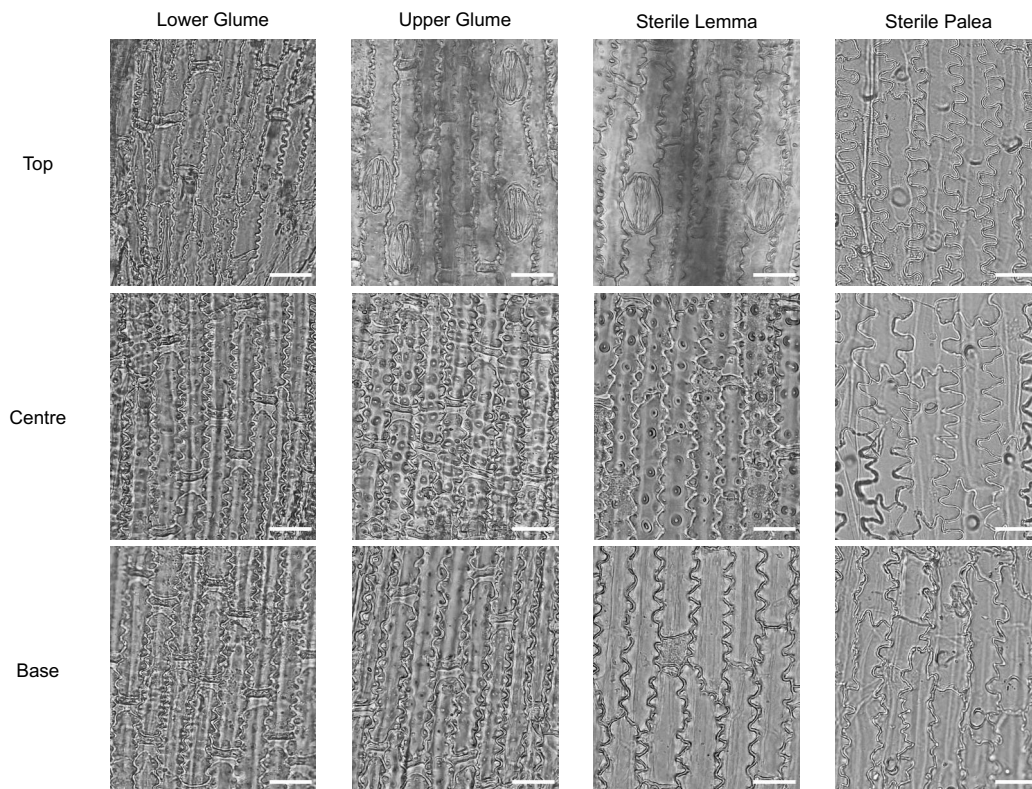


Fig. 13. Articulated phytolith classification key for *Panicum laetum* glumes and sterile floret. Characterised by BILOBATE (short tabular concave lobes and short tabular convex lobes), ELONGATE CLAVATE/DENTATE and ACUTE BULBOSUS morphotypes. Weakly silicified INTERDIGITATE morphotypes with basic η -type undulations and PAPILLATE attached to the central cell body were observed in the sterile palea. Scale bar (20 μ m) applies to all panels.

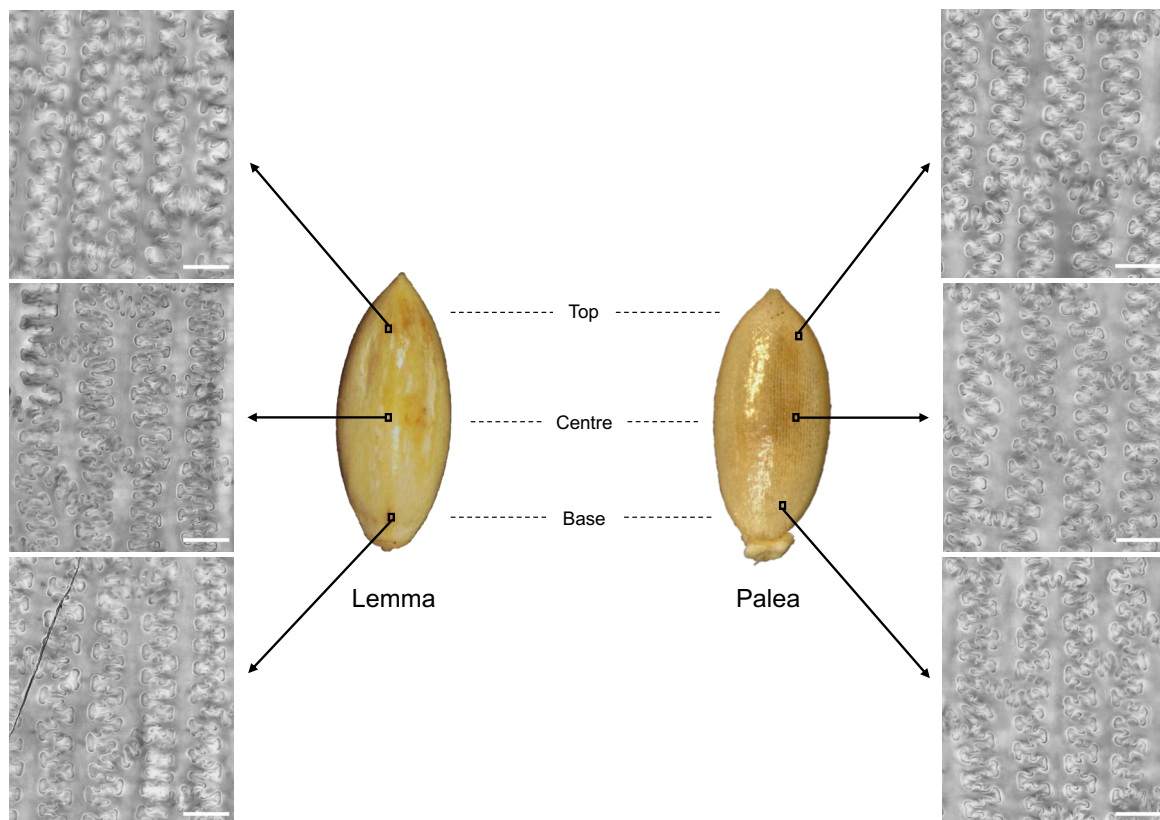


Fig. 14. INTERDIGITATE phytolith classification key for *Panicum laetum* fertile floret. INTERDIGITATE morphotypes were η -type level II – III with intricate ARTICULATE/BRACHIATE terminal margins. Scale bar (20 μ m) applies to all panels.

***Panicum turgidum* Forssk**

Phytoliths were present in all analysed bracts. The glumes and sterile lemma were characterised by BILOBATE (short tabular concave lobes), ELONGATE CLAVATE/DENTATE, ACUTE BULBOSUS and PAPILLATE morphotypes. RONDEL morphotypes were only observed in the upper glume. INTERDIGITATE morphotypes in the fertile floret of *P. laetum* were η -type level I – II undulations, with narrower bases and more rounded apices than those of *P. anabaptistum*. Terminal margins were ARTICULATE. PAPILLATE cells were absent in the fertile floret.

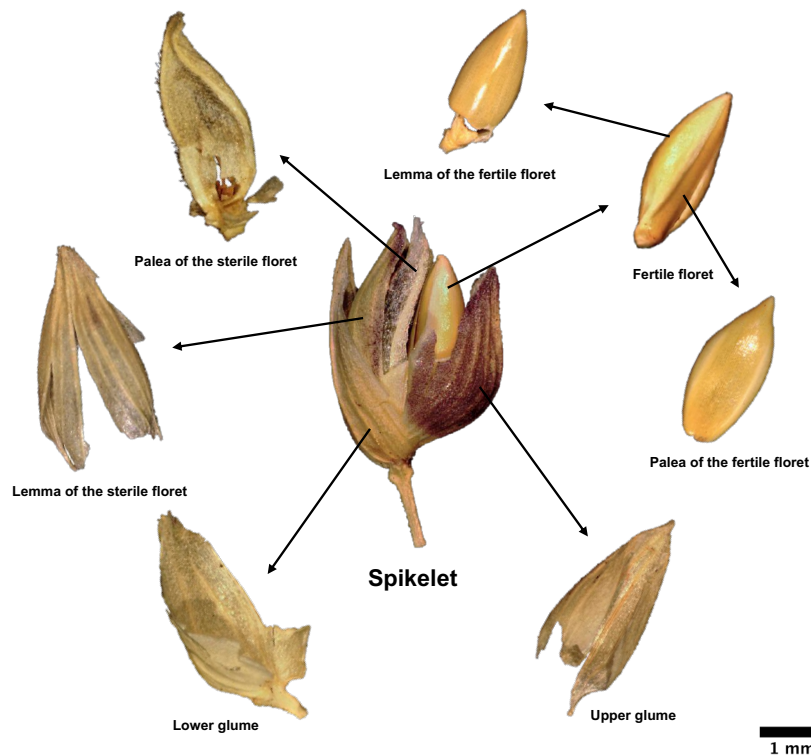


Fig. 15. Dissected *Panicum turgidum* spikelet.

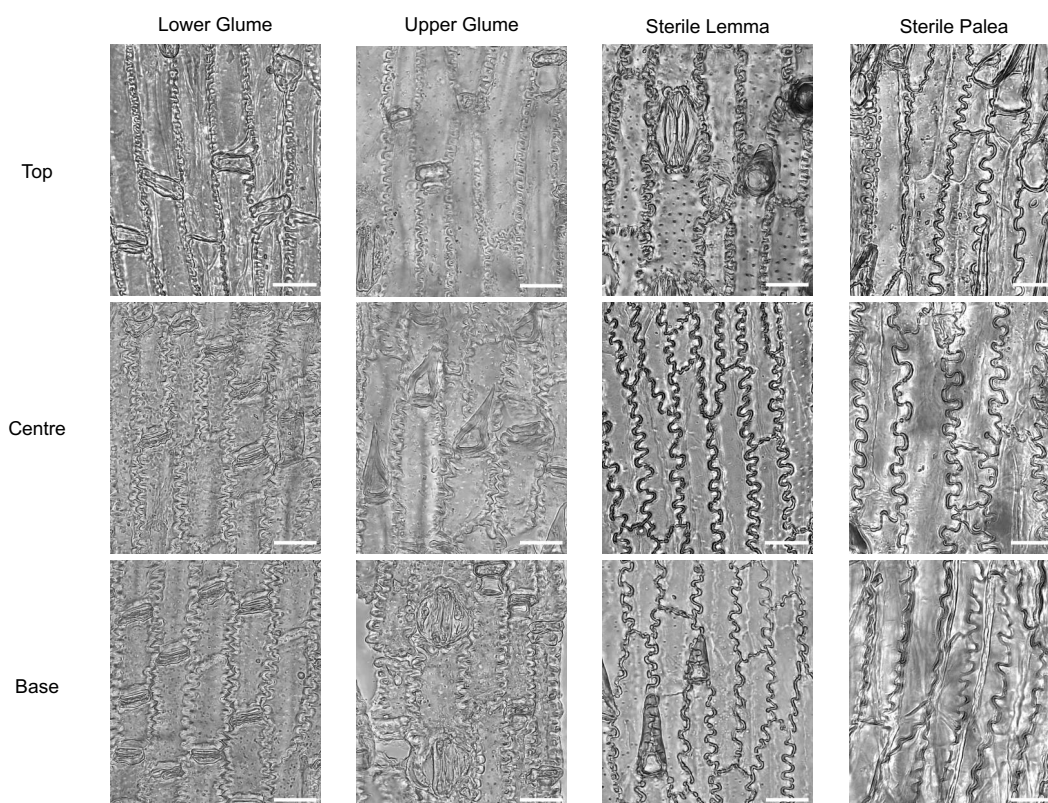


Fig. 16. Articulated phytolith classification key for *Panicum turgidum* glumes and sterile floret. Characterised by BILOBATE (short tabular concave lobes), ELONGATE CLAVATE/DENTATE, ACUTE BULBOSUS and PAPILLATE morphotypes. RONDEL morphotypes were only observed in the upper glume. Scale bar (20 μ m) applies to all panels.

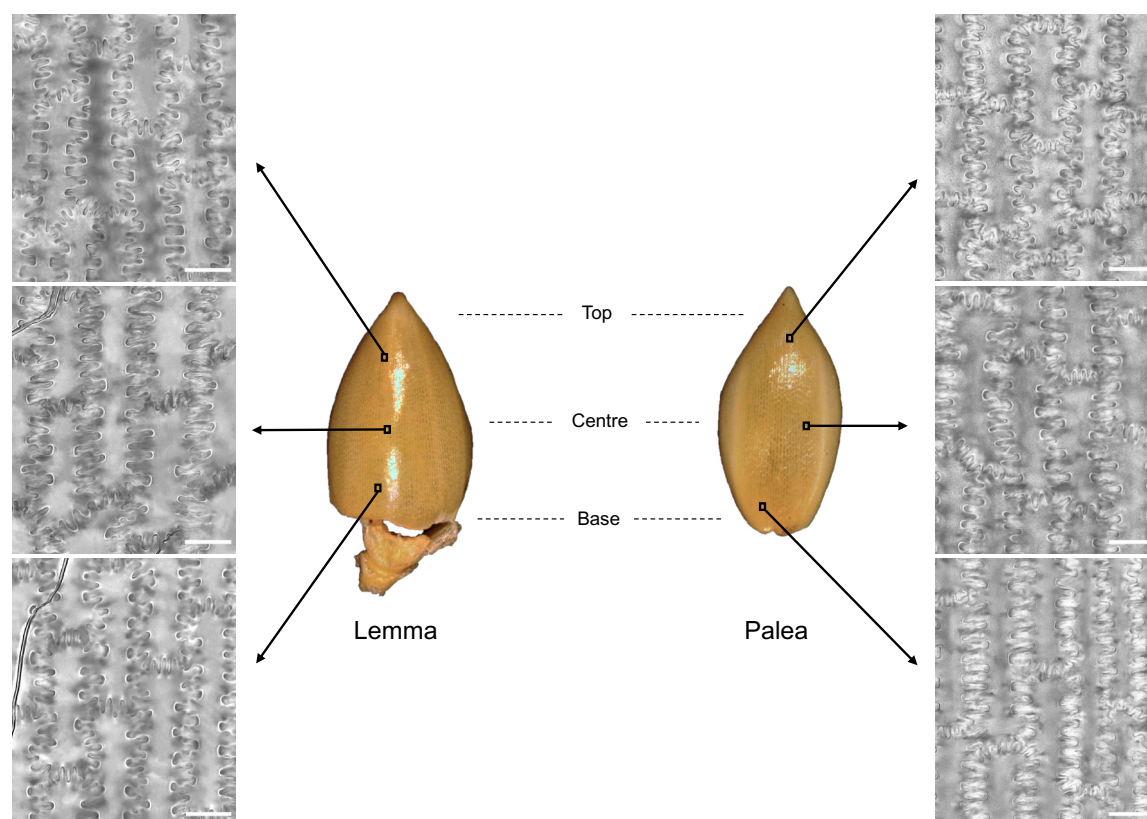


Fig. 17. INTERDIGITATE phytolith classification key for fertile spikelet parts of *Panicum turgidum*. INTERDIGITATE morphotypes were η -type level I – II undulations, with narrower bases and more rounded apices than those of *P. anabaptistum*. Terminal margins were ARTICULATE. PAPILLATE cells were absent in the fertile floret. Scale bar (20 μ m) applies to all panels.

***Pennisetum divisum* (Forssk ex J.F.Gmel.) Henrard**

Phytoliths were present in all analysed bracts. The glumes and sterile floret were characterised by BILOBATE (short tabular concave lobes), ELONGATE DENTATE/ENTIRE and ACUTE BULBOSUS morphotypes. Weakly silicified INTERDIGITATE η -type level I – II morphotypes with large PAPILLATE cells separate from the central cell body, were observed in the fertile floret. Terminal margins were ARTICULATE.

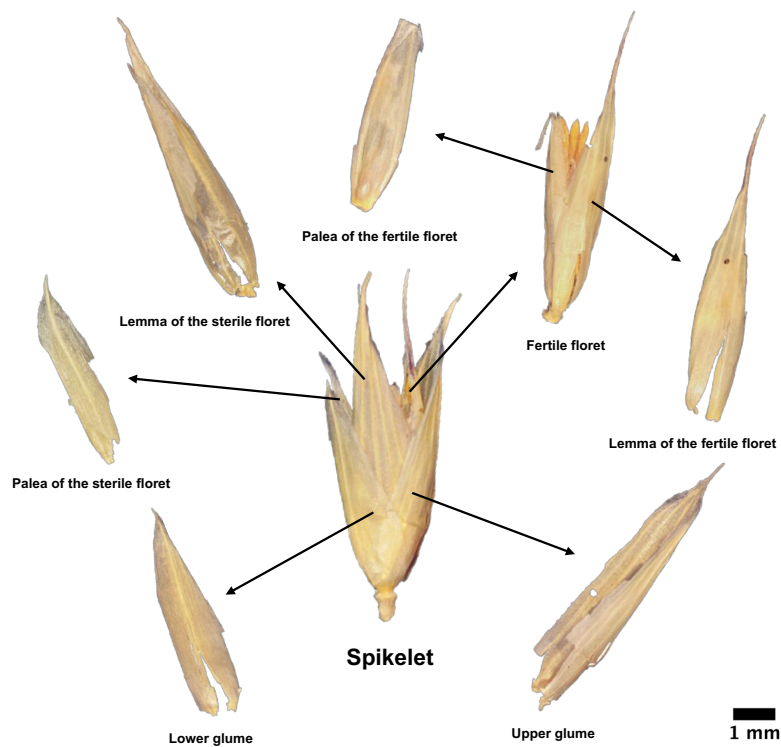


Fig. 18. Dissected *Pennisetum divisum* spikelet.

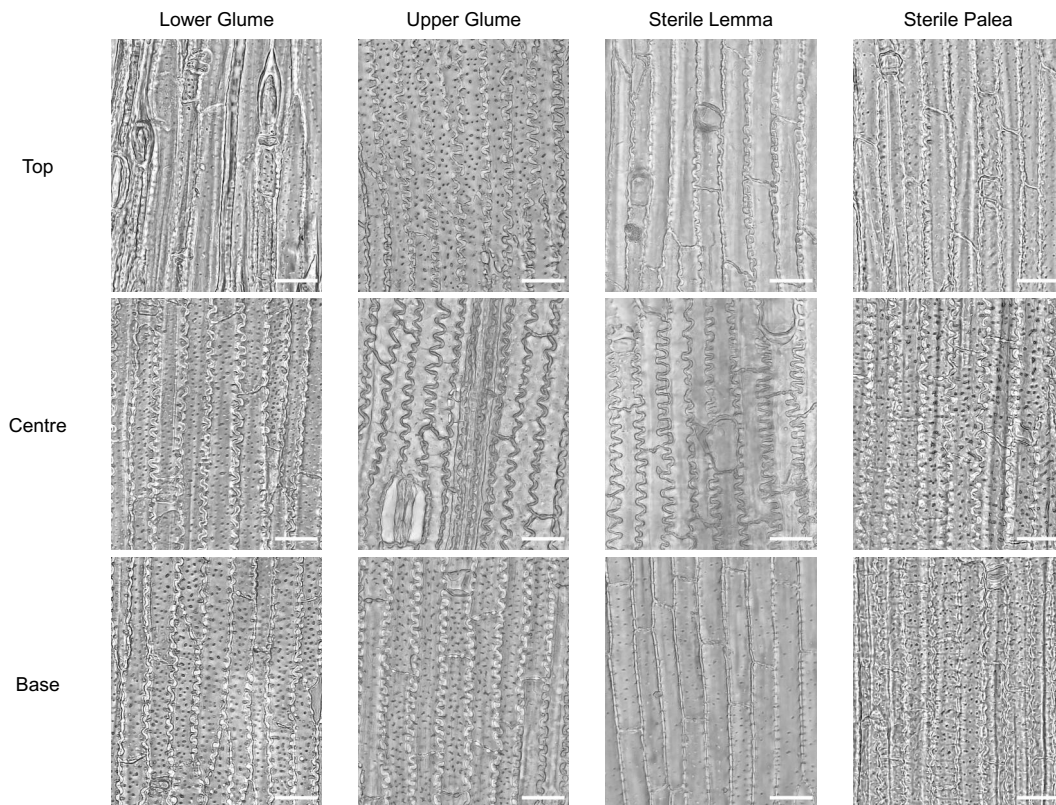


Fig. 19. Articulated phytolith classification key for *Pennisetum divisum* glumes and sterile floret. Characterised by BILOBATE (short tabular concave lobes), ELONGATE DENTATE/ENTIRE and ACUTE BULBOSUS morphotypes. Scale bar (20 µm) applies to all panels.

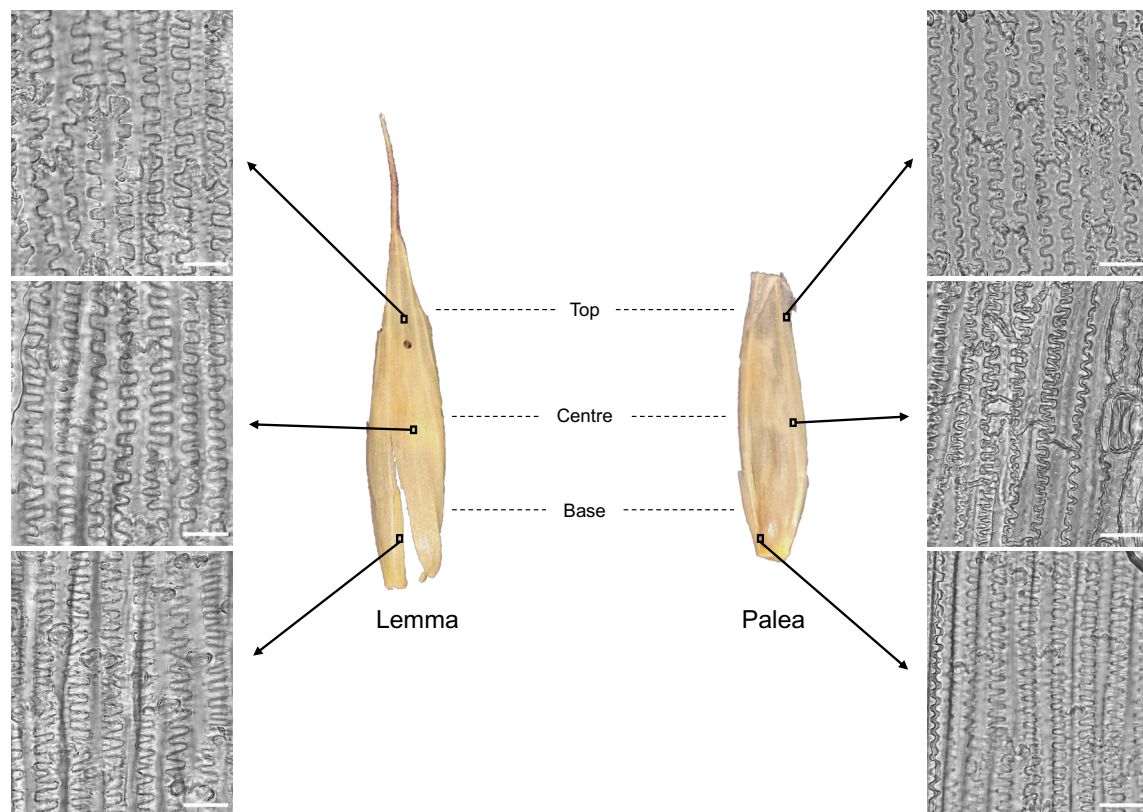


Fig. 20. INTERDIGITATE phytolith classification key for *Pennisetum divisum* fertile floret. Weakly silicified INTERDIGITATE morphotypes were η -type level I-II, with large PAPILLATE cells separate from the central cell body. Terminal margins were ARTICULATE. Scale bar (20 µm) applies to all panels.

***Setaria sphacelata* (Schumach.) Stapf & C.E.Hubb. ex Moss**

Phytoliths were present in all analysed bracts. The glumes and sterile floret were characterised by BILOBATE short tabular concave lobes, ELONGATE CLAVATE/DENTATE/SINUATE and ACUTE BULBOSUS morphotypes. ELONGATE cells in the glumes were more SINUATE than DENTATE. INTERDIGITATE morphotypes in the fertile floret were characterised by Δ -type level I – III with large PAPILLATE attached to the central cell body. Δ -type level III undulations were only observed in the centre of the fertile palea. Terminal margins were REPAND/SINUOLATE within the fertile lemma and ARTICULATE within the fertile palea. Pronounced PAPILLATE matched the ornate epidermal patterns on the abaxial surface of the fertile lemma and were less pronounced in the fertile palea.

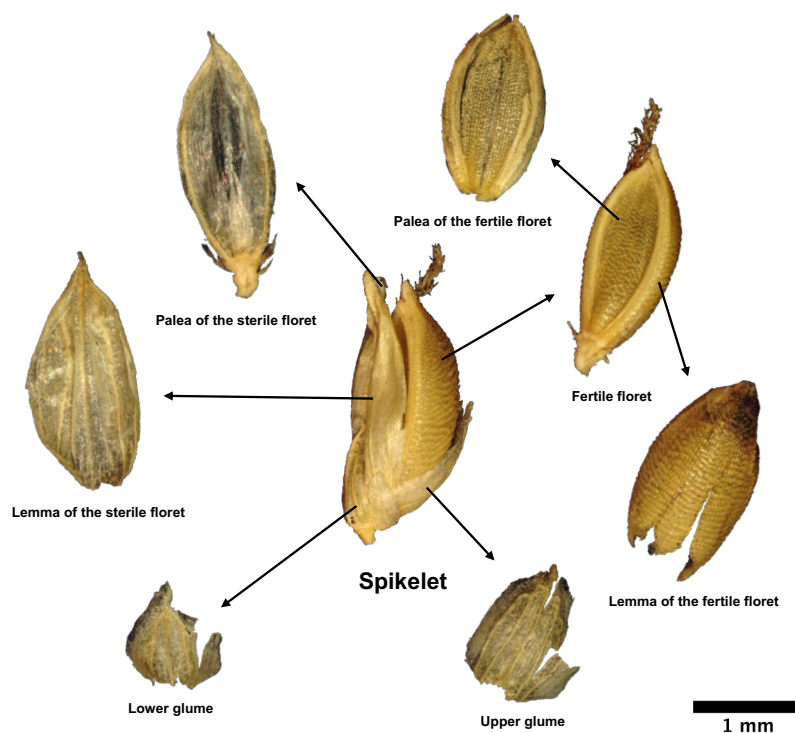


Fig. 21. Dissected *Setaria sphacelata* spikelet.

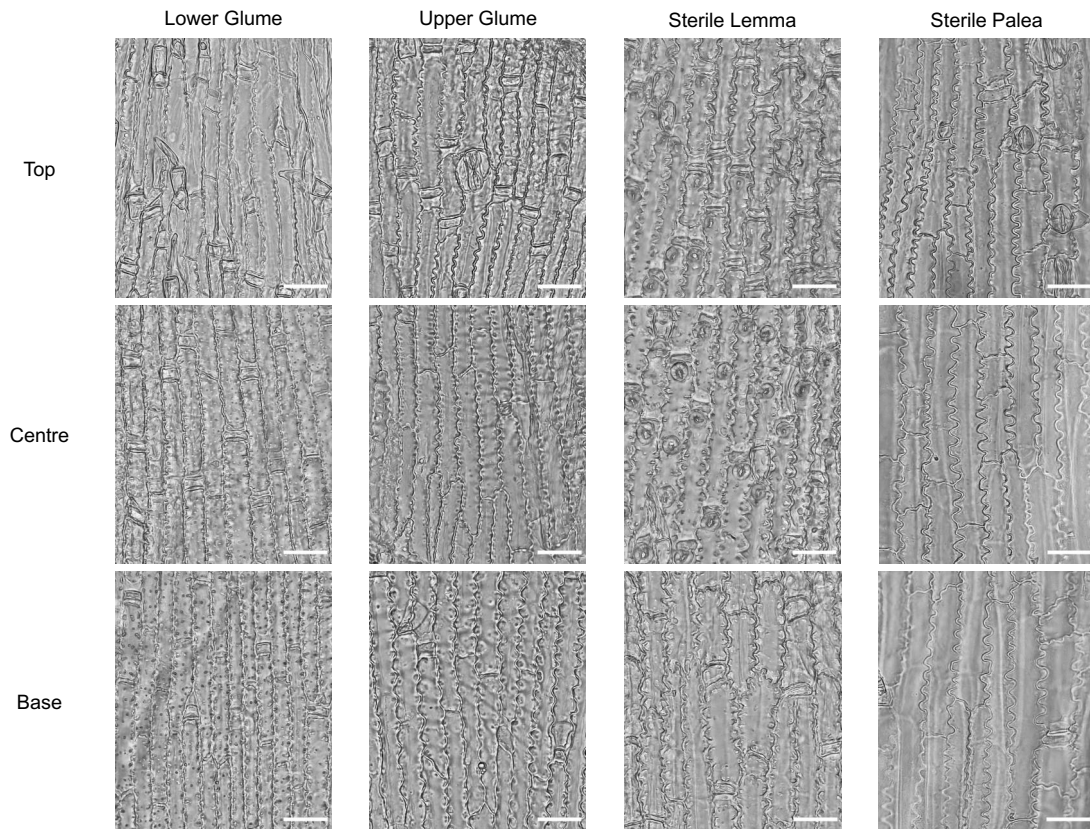


Fig. 22. Articulated phytolith classification key for *Setaria sphacelata* glumes and sterile floret. Characterised by BILOBATE short tabular concave lobes, ELONGATE CLAVATE/DENTATE/SINUATE and ACUTE BULBOSUS morphotypes. ELONGATE cells in the glumes were more SINUATE than DENTATE. Scale bar (20 µm) applies to all panels.

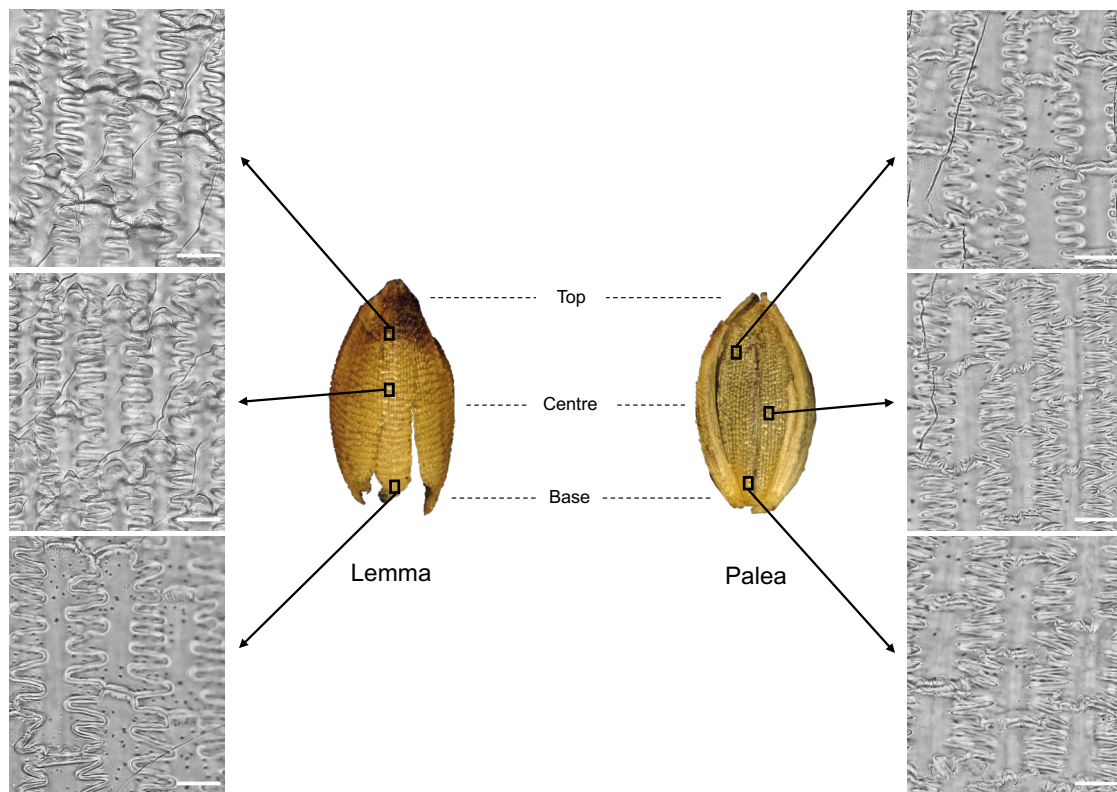


Fig. 23. INTERDIGITATE phytolith classification key for *Setaria sphacelata* fertile floret. INTERDIGITATE morphotypes were Λ -type level I – III with large PAPILLATE attached to the central cell body. Λ -type level III undulations were only observed in the centre of the fertile palea. Terminal margins were REPAND/SINUOLATE within the fertile lemma and ARTICULATE within the fertile palea. Scale bar (20 µm) applies to all panels.

***Sorghum bicolor* subsp. *verticilliflorum* Steud.) de Wet ex
Xe Wiersema & J. Dahlb. (syn. *S. arundinaceum* (Desv.) Stapf)**

Phytoliths were present in all analysed bracts. The lemma of the sterile and fertile floret was weakly silicified with ELONGATE CLAVATE/ENTIRE/SINUATE and ACUTE BULBOSUS morphotypes. CROSS (tabular 4 lobed) morphotypes were present only in the lemma of the sterile floret. ELONGATE cells in the lemma of the fertile floret had reduced ornamentation. The palea of the sterile and fertile floret were also weakly silicified, with no short cells observed. The pedicellate glumes were characterised by BILOBATE (short tabular convex), CROSS (tabular 4 lobed) and ELONGATE CLAVATE phytoliths. The sessile glumes had characteristic BILOBATE (short tabular round lobes) and ELONGATE CLAVATE patterns.

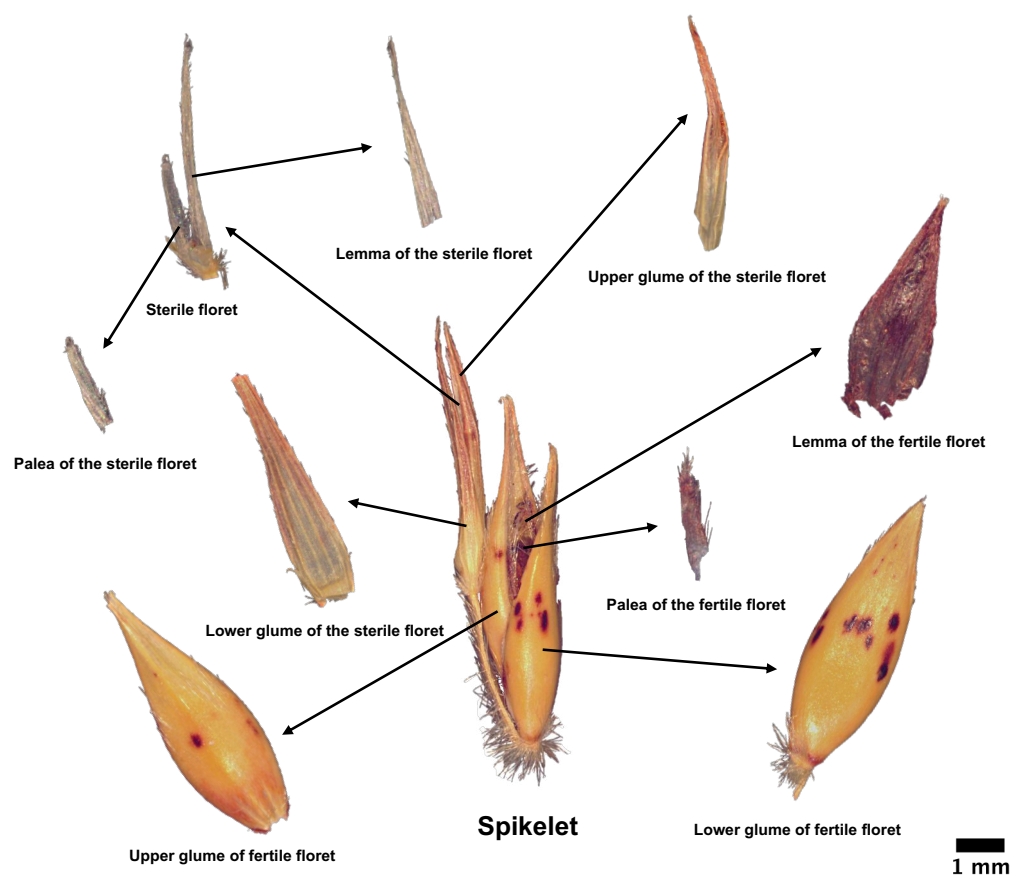


Fig. 24. Dissected *Sorghum bicolor* subsp. *verticilliflorum* spikelet.

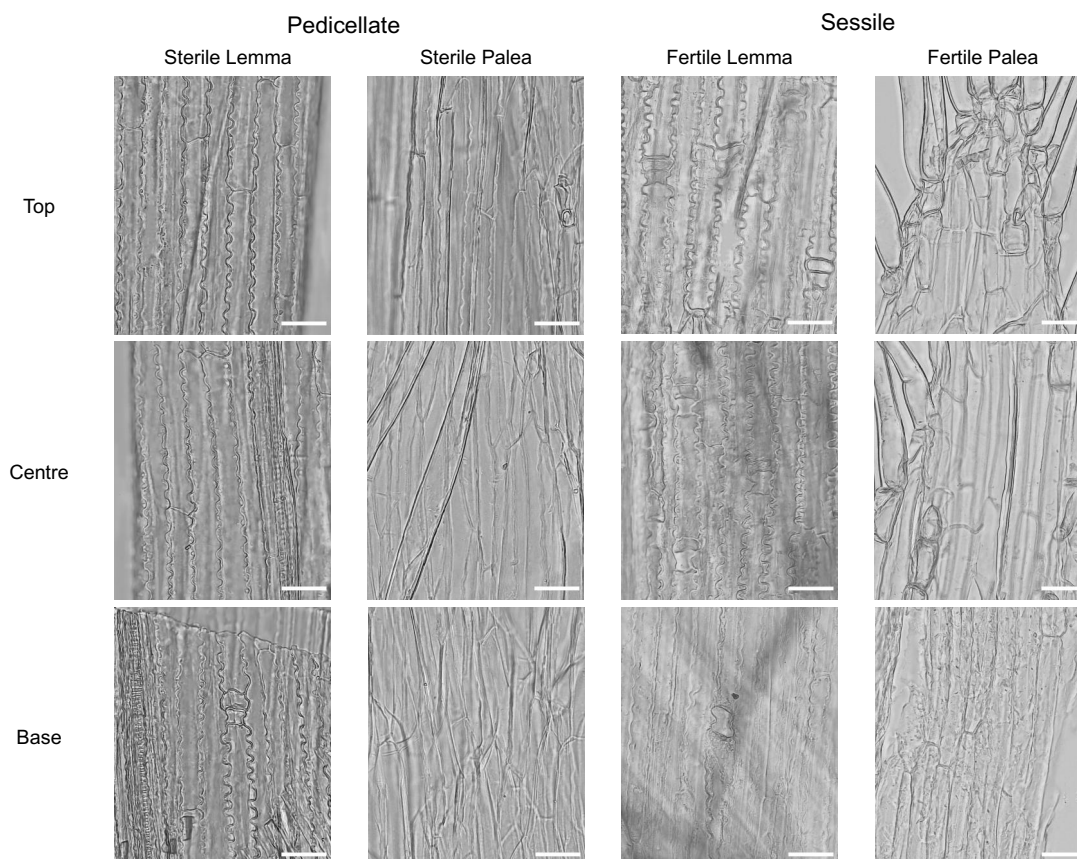


Fig. 25. Articulated phytolith classification key for *Sorghum bicolor* subsp. *verticilliflorum* lemma and palea of the pedicellate and sessile floret. The lemma of the sterile and fertile floret was weakly silicified with ELONGATE CLAVATE/ENTIRE/SINUATE and ACUTE BULBOSUS morphotypes. CROSS (tabular 4 lobed) morphotypes were present only in the lemma of the sterile floret. ELONGATE cells in the lemma of the fertile floret had reduced ornamentation. The palea of the sterile and fertile floret were also weakly silicified, with no short cells observed. Scale bar (20 μ m) applies to all panels.

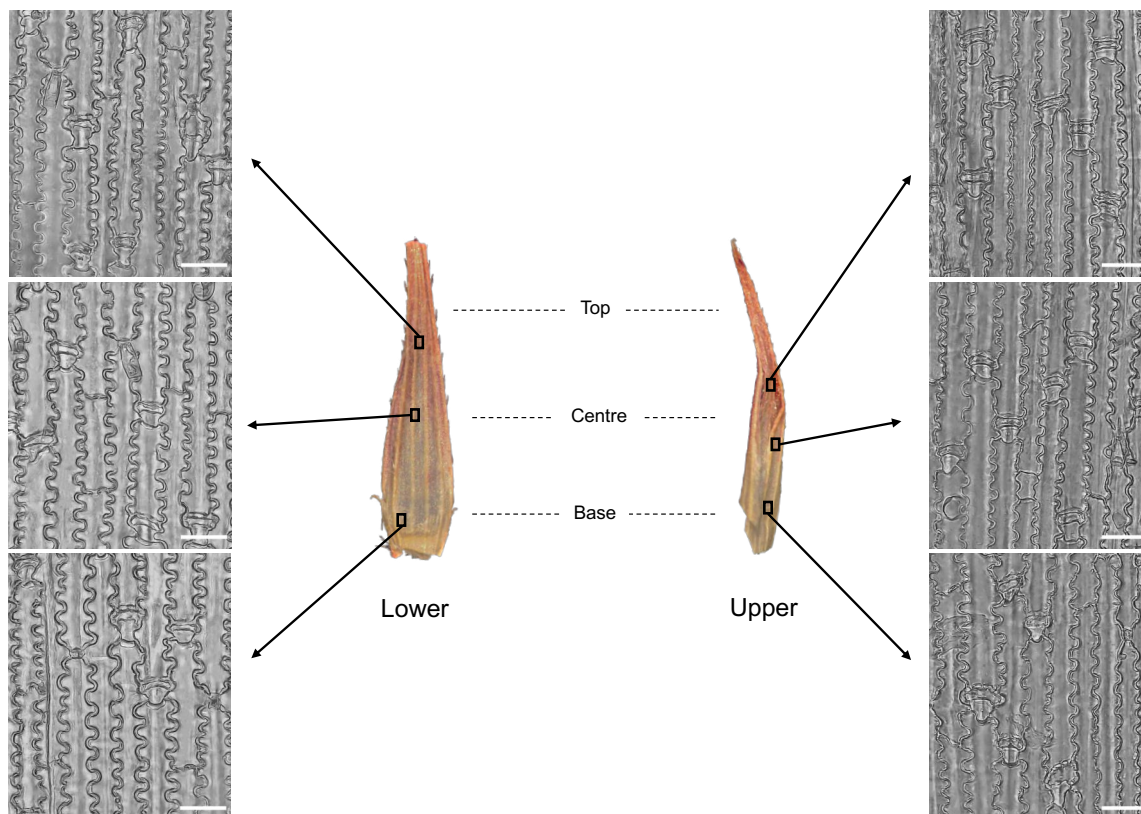


Fig. 26. Articulated phytolith classification key for *Sorghum bicolor* subsp. *verticilliflorum* pedicellate glumes. Characterised by BILOBATE (short tabular convex), CROSS (tabular 4 lobed) and ELONGATE CLAVATE phytoliths. Scale bar (20 µm) applies to all panels.

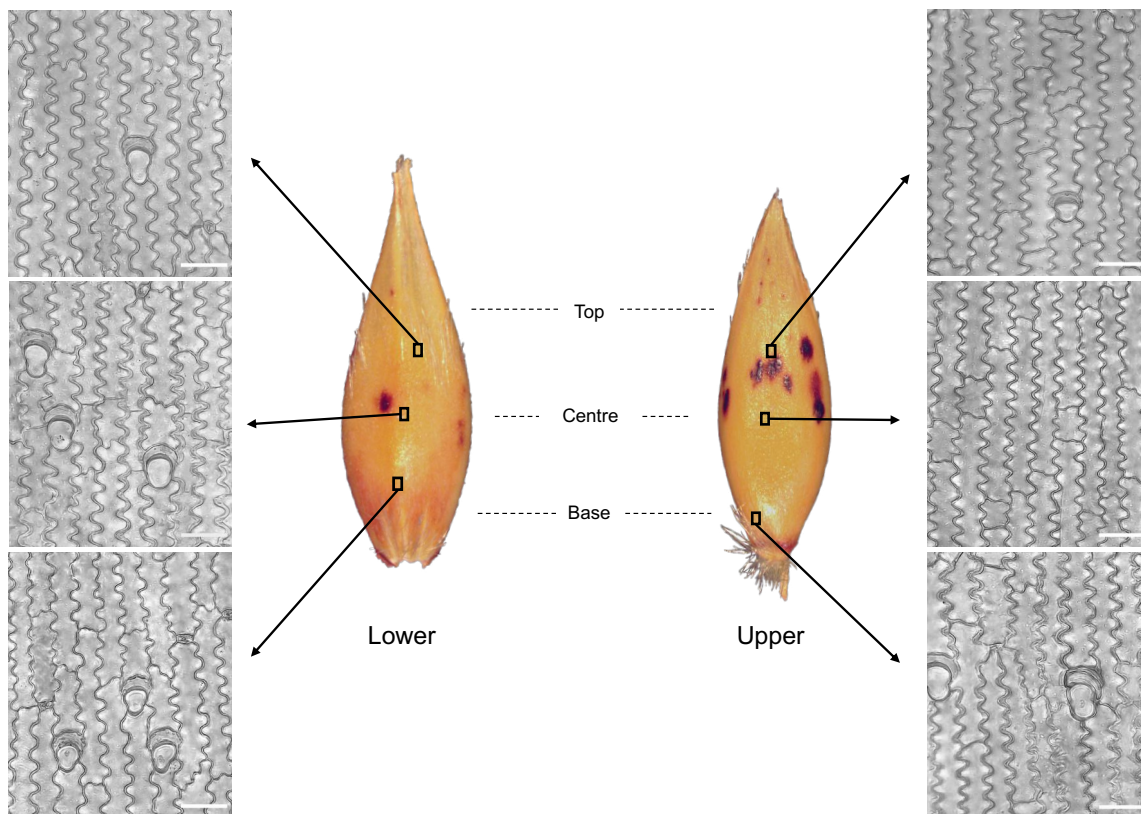


Fig. 27. Articulated phytolith classification key for *Sorghum bicolor* subsp. *verticilliflorum* sessile glumes. Characteristic BILOBATE (short tabular round lobes) and ELONGATE CLAVATE patterns. Scale bar (20 µm) applies to all panels.