SYSTEMATIC AND AUTECOLOGICAL STUDIES ON GRASSES

Especially on the Taxonomic Characters of Grass Seedlings

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The present study will be described to the taxonomical characters of some grass seedlings, which are the most representative species in Festucoideae, Eragrostoideae and Panicoidea.

(1) Festucoideae

1. *Poa nipponica* Koidz.

The first seedling leaf narrowly linear, acute at the apex, about 20-30mm long and 0.3-0.5mm wide, glabrous, the leaf standing perpendicularly; the second to the fifth leaves linear, acuminate at the apex, the leaves incline ascendent when mature, but almost aslant straightly. (Fig. 1).

2. *Bromus mollis* Linn.

The first seedling leaf linear, blunt or subacute at the apex, about 30-40mm long and 1mm wide, thinly hairy over both surfaces, standing perpendicularly, but turns almost aslant straightly after the second leaf appears; the second to fifth leaves linear, acute at the apex, sparsely hairy over both surfaces. (Fig. 2).

3. *Elymus dahuricus* Turcz.

The first seedling leaf linear, acute at the apex, about 40-50mm long and 1.5-1.8mm wide, hairy all over, the leaf standing perpendiculary; the second to fifth leaves linear, acute at the apex, covered soft hairs on both surfaces. (Fig. 3).

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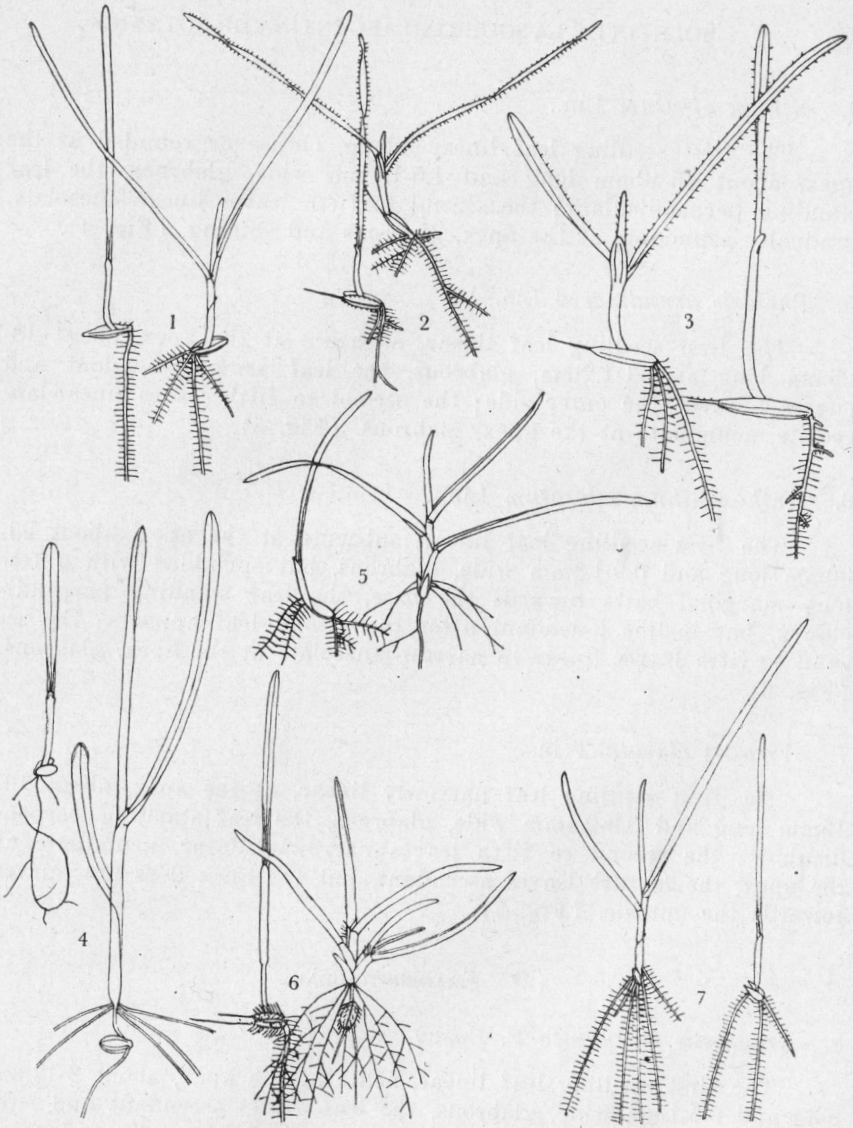


Figs. I

1. *Poa nipponica* KOIDZ.
2. *Bromus mollis* L.
3. *Elymus dahuricus* TURCZ.
4. *Milium effusum* L.
5. *Phalaris arundinacea* L.
6. *Authoxanthum odoratum* LINN.
7. *Agrostis clavata* TRIN.

4. *Milium effusum* Lin..

The first seedling leaf linear-oblong, obtuse or rounded at the apex, about 15-40mm long and 1.5-1.8mm wide, glabrous, the leaf standing perpendiculary; the second to fifth leaves linear-lanceolate, gradually acuminate at the apex, glabrous and shining. (Fig. 4).

5. *Phalaris arundinacea* Lin..

The first seedling leaf linear, subacute at the apex, about 18-25mm long and 1-1.2mm, glabrous, the leaf grows ascendant and curves towards the outer side; the second to fifth leaves linear-lanceolate, acuminate at the apex, glabrous. (Fig. 5).

6. *Anthoxanthum odoratum* Linn.

The first seedling leaf linear, subacute at the apex, about 25-30mm long and 0.9-1.1mm wide, glabrous, but sprinkled with a few long marginal hairs towards the base, the leaf standing perpendiculary, but incline ascendant after the second leaf appears; the second to fifth leaves linear to narrow-lanceolate at the apex, glabrous. (Fig. 6).

7. *Agrostis clavata* Trin.

The first seedling leaf narrowly linear, at the apex, about 10-15mm long and 0.3-0.4mm wide, glabrous, the leaf standing perpendiculary; the second to fifth leaves narrowly linear, acuminate at the apex, the mature leaves ascendant, but the apex does not curves towards the outside. (Fig. 7).

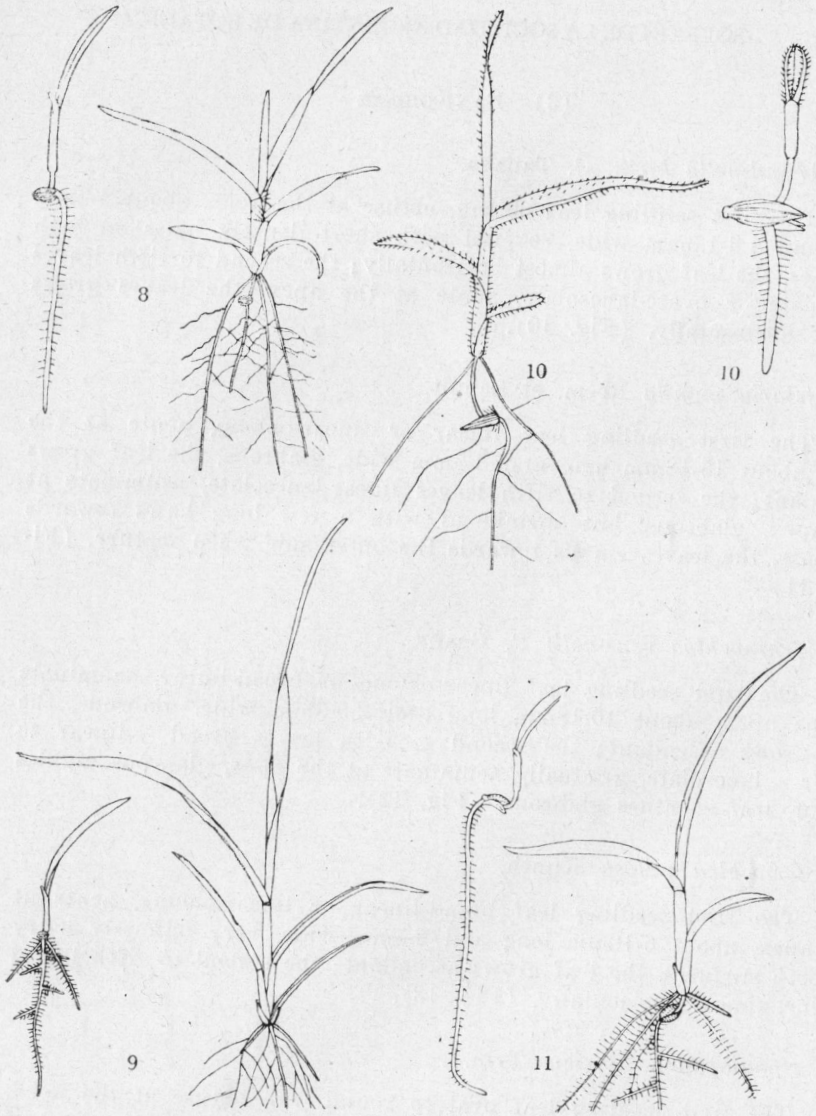
(2) Eragrostoideae

8. *Eragrostis ferruginea* P. Beauv.

The first seedling leaf linear, acute at the apex, about 6-12mm long and 0.5-1mm wide, glabrous, the leaf grows ascendant and curves towards the outer side; the second to fifth leaves linear-lanceolate, acuminate or gradually acuminate at the apex, glabrous. (Fig. 8).

9. *Sporobolus elongatus* R. Br.

The first seedling leaf narrowly linear, acute at the apex, about 8-15mm long and 0.6-0.9mm wide, glabrous, the leaf grows ascendant and curves towards the outer side; the second to fifth leaves linear, gradually acuminate at the apex, glabrous. (Fig. 9).



Figs. II

8. *Eragrostis ferruginea* P. Beauv.

9. **Sporobolus elongatus** R. Br.

10. *Arundinella hirta* C. Tanaka

11. *Setaria pumila* Roem. et Schult.

(3) PANICOIDEAE

10. *Arundinella hirta.* C. Tanaka.

The first seedling leaf oblong, obtuse at the apex, about 4-5mm long and 1.3-1.6mm wide, covered with short densely hairs on both surfaces, the leaf grows almost horizontally; the second to fifth leaves lanceolate or ovate-lanceolate, acute at the apex, the leaves grows almost horizontally. (Fig. 10).

11. *Setaria pumila* Roem. et Schult.

The first seedling leaf linear or linear-oblong, acute at the apex, about 15-18mm long and 3-5mm wide, glabrous, the leaf grows ascendant; the second to fifth leaves linear-lanceolate, acuminate at the apex, glabrous, but sprinklend with a few long hairs towards the base, the leaves curves towards the outer side when mature. (Figure 11).

12. *Echinochloa crus-galli* P. Beauv.

The first seedling leaf linear-oblong or broad-linear, acuminate at the apex, about 10-18mm long and 2.5-3mm wide, glabrous, the leaf grows ascendant; the second to fifth leaves broad —linear to linear— lanceolate, gradually acuminate at the apex, glabrous, ligules absent, leaf sheathes glabrous. (Fig. 12).

13. *Eriochloa villosa* Kunth.

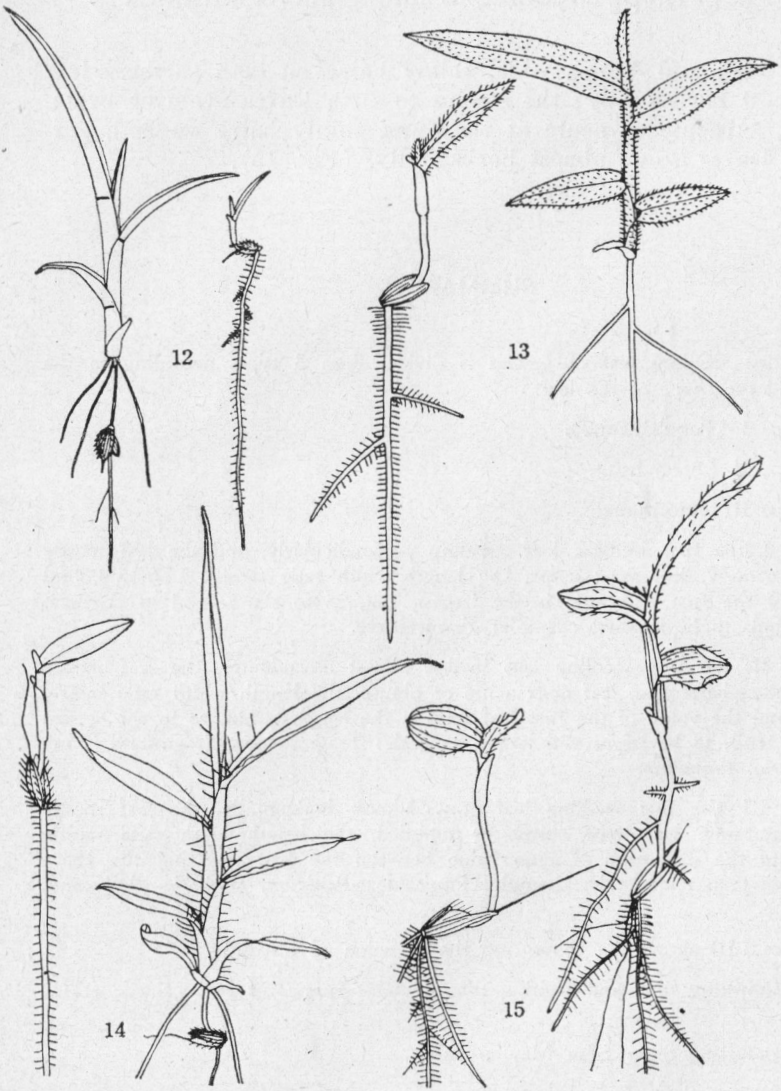
The first seedling leaf broad-linear or linear-oblong, acute at the apex, about 6-10mm long and 2-4mm wide, very minutely hairy on both surfaces, the leaf grows ascendant; the second to fifth leaves incline almost horizontally. (Fig. 13).

14. *Spodiopogon sibiricus* Trin.

The first seedling leaf oval to round-oval, obtuse at the apex, about 6-9mm long and 3-3.5mm wide, glabrous or nearly so, the leaf grows almost horizontally; the second to fifth leaves oblong-lanceolate, acute or acuminate at the apex, glabrous or with a few long marginal hairs towards the base, the leaves inclines almost horizontally when mature. (Fig. 14).

15. *Microstegium vimineum* A. Camus.

The first seedling leaf round-oval, rounded at the apex, about



Figs. III

12. *Echinochloa crus-galli* P. Beauv. 13. *Eriochloa villosa* Kunth

14. *Spodiopogon sibiricus* Trin. 15. *Microstegium vimineum* A. Camus

5.5-8.5mm long and 4-5mm wide, thinly hairy on both surfaces leaf grows almost horizontally; the second to fifth leaves ovate or ovate-lanceolate, subacute or acute at the apex, thinly hairy on both surfaces, the leaves grows almost horizontally. (Fig. 15).

SUMMARY

The first seedling leaf of grasses is divided into 3 types according to the direction and the shape of the leaf.

1 Type I (Perpendicular).

2 Type II (Ascendant).

3 Type III (Horizontal).

Type I, the first seedling leaf standing perpendicularly, and the leaf mostly linear or narrowly, leaf apex acute, the length/width ratio mostly 15.0-35.0, and the value of the first leaf ratio is the largest, but, as to the second or third, it gradually tends to be smaller, example: Festucoideae.

Type II, the first seedling leaf incline almost ascendently, the leaf mostly linear or oblong-lanceolate, leaf apex acute or obtuse, the length/width ratio mostly 3.5-15.0, and the value of the first leaf ratio is the smallest, but, as to the second or third, it tends to be larger and larger, example: Eragrostoideae-Eragrosteae, Panicoideae-*Setaria, Paspalum.*

Type III, the first seedling leaf grows almost horizontally, the leaf mostly oval to round-oval, leaf apex obtuse or rounded, the length/width ratio mostly 1.5-5.5, and the difference of ratio value between the first leaf and the above second is not seen remarkably, example: *Panicoideae-Panicum, Digitaria, Arthraxon, Microstegium.*

Figures I-III shows the shape and the direction of leaves.

The flowering time and fruiting time of most species of Festucoideae are as follows:

The flowering time: from May to July.

The fruiting time: from July to August.

But inspecies of Eragrostoideae and Panicoideae the flowering time is in Aug.-Sept. and the fruiting time in Sept.-Oct.

Seeds of most species of Festucoideae examined can germinate soon after maturity. But, in the species Eragrostoideae and Panicoideae, the seeds do not germinate until next spring.

LITERATURE CITED

Al-Aish, M., and W. V. Brown. 1958. Amer. J. Bot. 45: 16-23.

Avdulov, N. 1931. Bull. Appl. Genet. etc., Suppl. 44: 1-428.

Brown, W. 1958. Bot. Gaz. 119: 170-78.
——and W. M. Emery. 1957. Amer. J. Bot. 44: 585-90.
——and C. Heimsch. 1957. Amer. J. Bot. 44: 590-95.

Church, G. L. (1949). Amer. J. Bot. 36: 155-65.

De Wet, J. M. J. 1956. Amer. J. Bot. 43; 175-82.
——Proc. 1959. IX International Bot. Cong. II, Abstracts: 92.
——and L. J. Anderson. 1956. Cytologia 23: 113-18.

Dore, W. G. 1956. Bull. Torr. Bot. Club 83: 335-37.

Duval-Jouve, M. 1875. Ann. Sci. Nat. Bot. Ser. 6,1: 227-346.

Grob, A. 1896. Bibliotheca Bot. 7: 1-122.

Hayek, A. 1925. Öster. Bot. Zeit. 74: 249-55.

Hubbard, C. E. 1946. Blumea Suppl. 3: 10-21.

Hook. 1939. Ic. Pl. Tab. 3386.

Jacques-Felix, H. J. Agric. 1955. Tro. Bot. Appl. 2: 423-30.

Metcalfe, C. R. 1956. Bot. Mag. Tokyo 69: 391-400.

Potztal, E. 1952. Bot. Jb. 75: 551-69.

Reeder, J. R. 1953. Bull. Torr. Bot. Club 80: 187-96.
——1957. Amer. J. Bot. 44: 756-68.

Stebbins, G. L. 1956a. Evolution 10: 235-45.

Tateoka, T. 1955. J. Jap. Bot. 30: 199-208.
——1956. Bot. Mag. Tokyo 69: 83-96.
——1958. Bot. Gaz. 120: 101-109.

Van Tieghem, P. 1897. Ann. Sci. Nat. Bot. 8: 259-309.