Physiological and ecological studies of Digitaria plants. VII : On the external forms and germination of the seed of the Hispid type of Digitaria adscendens (H.B.K.) Henrard

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https://doi.org/10.5109/22672

出版情報：九州大学大学院農学研究院紀要. 11 (1), pp.37-43, 1957-08. Kyushu University
バージョン：
権利関係：

Journal of the Faculty of Agriculture, Kyūshū University, Vol 11, No. 1
August 30, 1957

Physiological and ecological studies of *Digitaria* plants. VII
On the external forms and germination of the seed of the Hispid type of *Digitaria adscendens* (H.B.K.) Henrard

MASAMOTO SHIMIZU

INTRODUCTION

Kondo and others (1935) reported on the external forms of the seed of *Syntherisma sanguinalis* Dulac var. *cilialis* Honda.

But the detailed reports on the forms of the seed of *Digitaria adscendens* (H.B.K.) Henrard (this name is the synonym of the species above mentioned) are not seen, and the papers concerning the germination process of it are not found, and so the author has studied the Hispid type* of the species.

Observations of the seed forms and its germination process are useful to elucidate the mechanism of dormancy in the seed.

It is my pleasure to record here a debt of gratitude to Professor H. Kojima for his kindness in leading me in this study.

THE FORMS OF THE SEED†

Inflorescence of 5–10 racemes (rarely more or less). The racemes, 4–18 cm long, very slender, are digitate at the apex of the culm, finally spreading.

Spikelets in pairs, along one side of the racemes, contiguous, short-unequally pedicelled, falling entire at maturity, somewhat flattened on the back, oblong, pointed.

* The Hispid type of *Digitaria adscendens* (H.B.K.) Henrard is the same as *D. adscendens* Henrard var. *fimbriata* (Link) Henr. which had been described in a previous paper of the author (1956).

† In this paper spikelet was called "seed."

The spikelets are placed with the back of the lemma against the rachis, that is, with first glume, second glume, third glume, lemma, and palea of the fertile floret outward (Fig. 1).

Spikelets, about 3.5 mm long, about 1.0 mm wide, total weight of 1000 seeds measured immediately after the harvest was 1.3166-1.3232 gm and the air dried weight (weighed at the 394th day after the harvest) was 0.8660-0.8767 gm.

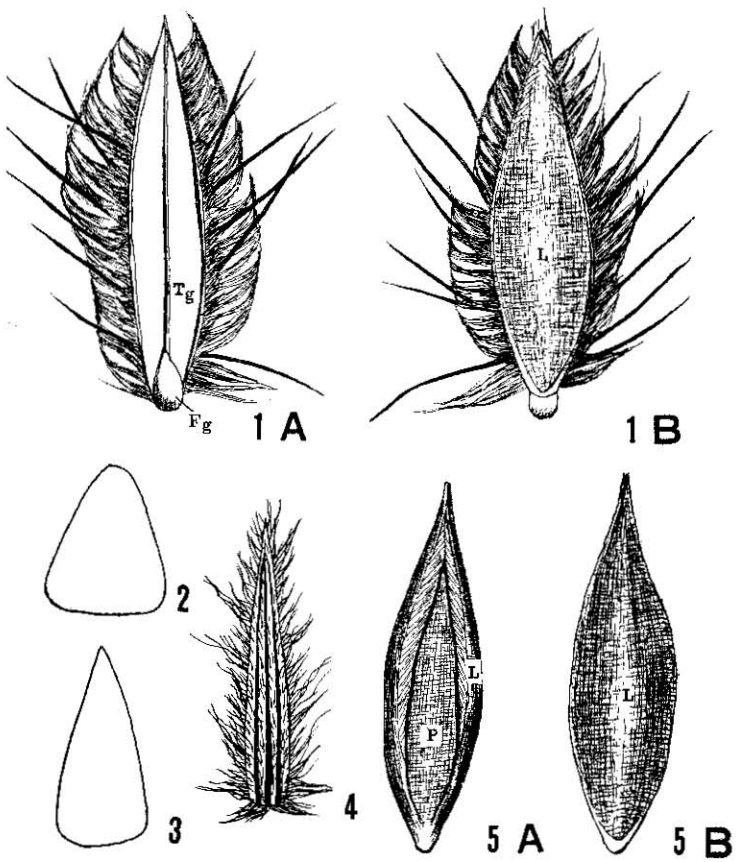

Fig. 1.

1. Two views of a spikelet. ×14.3
   1A: Front view. 1B: Back view, the second glume was removed.
2. The minute palea inside the third glume. ×43.3
3. The First glume. ×43.3
4. The Second glume. ×14.3
5. Two views of a spikelet; glumes were removed. ×14.3
   5A: Front view. 5B: Back view.
   Fg: First glume. L: Lemma. P: Palea. Tg: Third glume.

First glume outermost, minute but evident, triangular, about 0.8 mm long, 0.3 mm wide (Fig. 1, 3).

Second glume is on the opposite side to the first glume, lanceolate, pointed, 3-nerved, thin, 2.0–2.2 mm long (Fig. 1, 4).

Third glume flat or nearly so, widely lanceolate, the length and the width are similar to those of the spikelet without the third glume; strongly 3 nerved, the lateral nerves pubescent, the hairs 0.7–1.05 mm long, and tips of the hairs range in a row, and beside the hairs there

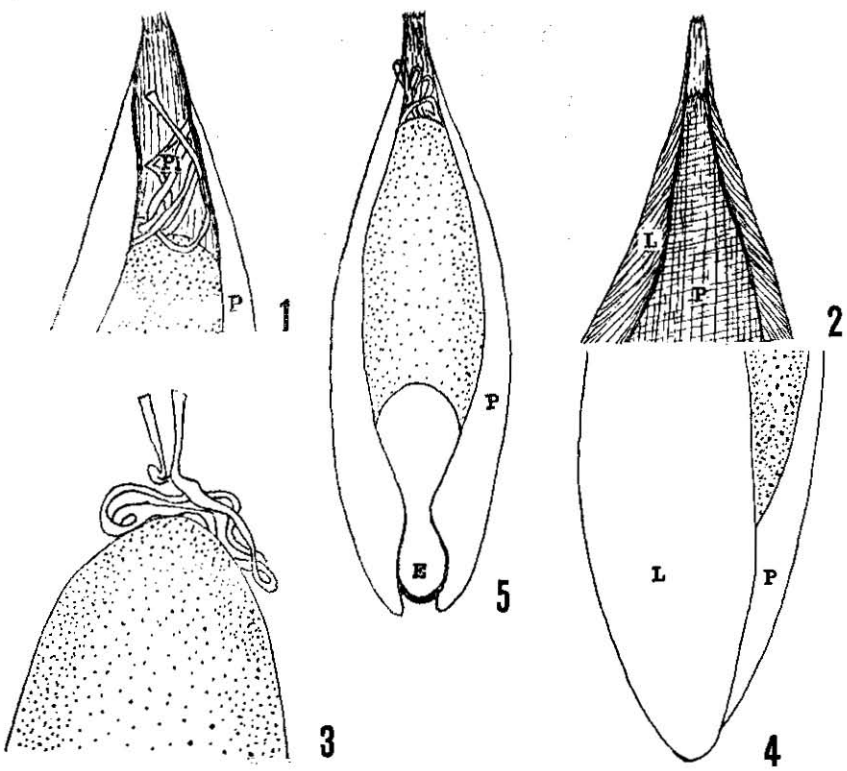

Fig. 2.

1. A pointed end of the palea, showing the shriveled pistil in an open space. ×52.
2. A pointed end of a spikelet; the glume was removed, showing the minute serration. ×52.
3. The shriveled pistil. ×52.
4. The base of a caryopsis enclosed by the hull; the lemma was removed. ×27.2.
5. The caryopsis is enclosed by the palea; the lemma was removed ×27.2.

E: Embryo. L: Lemma. P: Palea. Pi: Shriveled pistil.

exist some 5 brestles pectinately (2.0–2.8 mm long) on the back side of each hair zone (Fig. 1, 1A, 1B).

Third glume has a minute palea inside* (Fig. 1, 2). Lemma, as long as the third glume (and these two decide the length of the spikelet), pointed, firm except for the thin margin, smooth, darkbrown at maturity, oblong, being rounded on the back. Its margins tightly embrace the narrower and shorter inner scale known as the palea. The palea is flattened on the back (Fig. 1, 5).

The pointed tops of the lemma and palea minutely serrate (Fig. 2, 1, 2), and shriveled pistil remains in the open space of the top part (Fig. 2, 1, 5), and the shriveled stigma is often seen from the outside.

The caryopsis of the dormant seed is enclosed so tightly by hulls (lemma and palea) that it can not be stripped readily, but when the seed awakes from its dormancy the caryopsis separates from the hull easily.

Caryopsis 2.2–2.5 mm long, 0.8–0.9 mm wide, (Fig. 3) bears a shield-shaped body, the embryo, yellowish brown on its rounded side at the

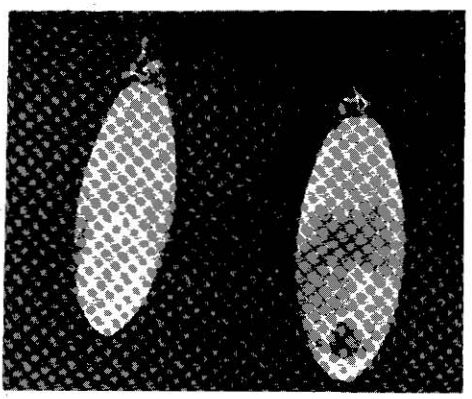

Fig. 3. Two views of a caryopsis. ×16.4
Left: Back view, showing embryo.
Right: Front view, showing hilum.

base and the other side of the caryopsis is flattened, with the hilum at the base.

The shriveled pistil on the top of the caryopsis about 2.4 mm long, 10 μ wide; its two stigmas stand in parallel (Fig. 2, 3).

* The spikelet of this genus has one perfect terminal floret and a sterile floret below, so I suppose that the third glume and the minute palea inside it correspond to a rudiment of the sterile floret.

Especially on the visible morphological changes on the embryo during the germination period.

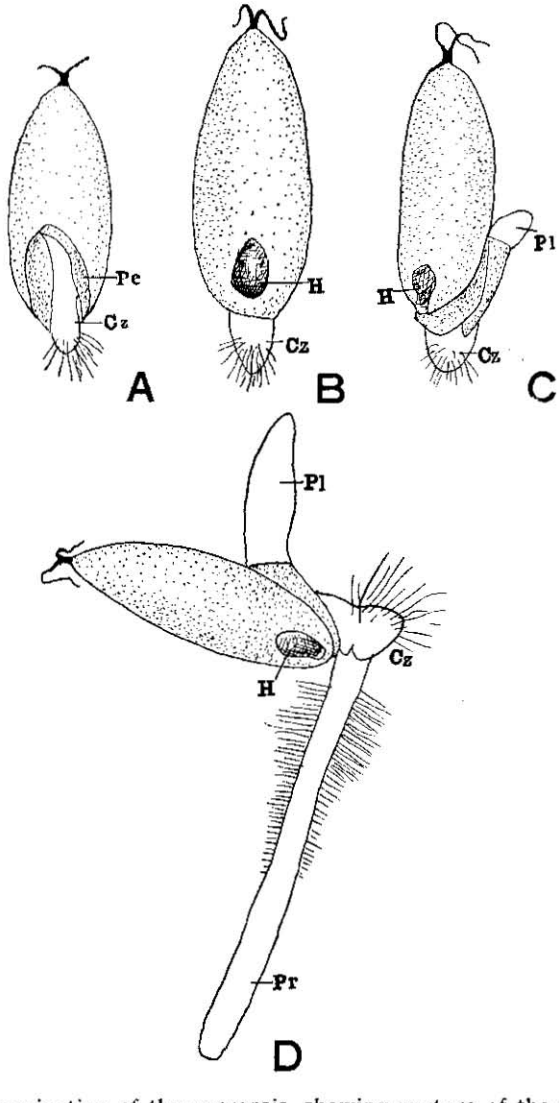

Fig. 4. Germination of the caryopsis, showing rupture of the pericarp by the coleorhiza and growing plumule and primary root. ×16.4
Cz: Coleorhiza. H: Hilum. Pe: Pericarp. Pl: Plumule. Pr: Primary root.

A seed awakened from the dormancy begins to germinate within two days after the sowing, at 30–35°C, on the seed bed.

A seed (caryopsis) which is on the point of germinating swells and its volume increases by the absorption of water compared with that of a dry caryopsis.

Soon the growing embryo bursts its covering near the base of the caryopsis; the first portion of it to emerge is the dilated coleorhiza, which tears the pericarp and makes a longitudinal slit (Fig. 4, A).

Without delay the plumule exposes itself to the opposite direction (Fig. 4, C).

Later, a number of long unicellular hairs, resembling root-hairs in form and function, often arise from the cells of the coleorhiza.

After the coleorhiza has grown about 0.5 mm long, the enclosed primary root bores through it, usually on one side (Fig. 4, D). The primary root elongates much more quickly than the plumule (Fig. 4, C, D).

As the spikelet is protected with glumes it is not usual that in the early stages of germination the plumule and the coleorhiza can be seen perfectly. If the glumes are removed these become to visible.

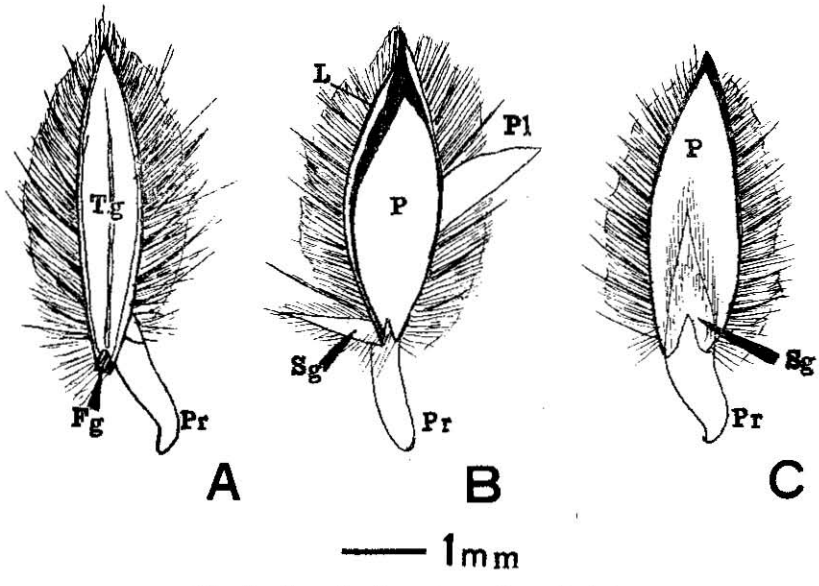

Fig. 5. Germination stage of a spikelet.

Fg: First glume. L: Lemma. P: Palea. Pl: Plumule.
Pr: Primary root. Sg: Second glume. Tg: Third glume.

The glowing plumule pulls apart the hull from the apex of the spikelet and appears on one side of the middle part of the spikelet (Figs. 5 and 6).

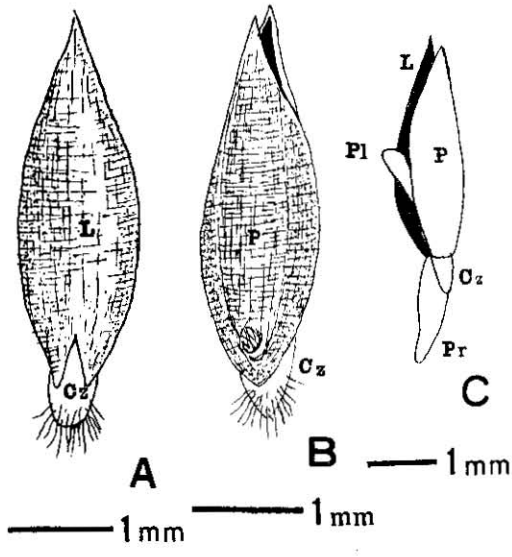

Fig. 6. Germination stage of a spikelet; glumes were removed.
Cz: Coleorhiza. L: Lemma. P: Palea. Pl: Plumule.
Pr: Primary root.

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