稲品種における胚の発育に関する形態学的研究（予報）*

末次讷（北陸農業試験場）

Developmental morphology of the embryo in rice varieties (preliminary)

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摘 要 本研究は稲品種における胚発育の過程を、種子作物発生の生態学的研究に進むべき第一段階として作物の発育形態学的見地から追査したもので、光をその一般過程を詳細に調べ、従来の研究を補足すると共に他の禾谷作物との比較を行い、更にかなり多数の品種について、その品種間差異及び開花以降の気象要因中特に気温との関係を考えながら検討し、併せて、類縁の異なる品種間の違いを観察したものである。その中、従来の諸研究に補足されるべき主な事項のみを摘記すれば次の通りである。

（1）従来の研究を総合すると、開花後 24 時間で胚芽原体の細胞数は 2～7 個となっているが、日本の暖地・九州で行われた本研究の結果を合わせ考察すると、日本では 2～12 個と概ねなるべきである。

（2）胚芽原体上に最初的胚分化の兆しが生ずる時期は、既往の諸研究では開花後 4〜8 日目となっているが、これは 3〜8 日目と改めるべきである。

（3）各器官の分化期は、品種の早発生と関連して品種間差異が認められ、早期の高温時に開花時を続ける模様するものは、秋季の低温時に開花する発生種に比し一般に遅い。

（4）従来の記録では、胚の形態的完成期を、開花後 10 日目或いは 14 日目頃とされているのが、これは 20〜25 日目とすべきである。本研究と過去の記録との相違は、胚の形態的完成期に対する見解の相違に基づくものと思考され、過去の研究では胚芽原体の吸収層の完成成はその発達に対する関心がなかったように想われる。

（5）変種における研究に基づいて筆者により設けられた胚発育の段階的条件の分け方は細部でも適用される。但し、分化葉数は 3 枚で、小麦及びライ麦と同様、第 IV 期を欠く。

（6）胚長・胚厚の発育相に品種間差異が認められるだけでなく、胚発育の一般形態も数種の型を区別されさらに日本型と印度型の間に大別することができる。芽生における発育形態が、品種間或は類縁の異なる品種間で異なることは、過去の研究で明らかにされているが、胚の発生段階に於て既に或る種の形態的特性が異なることは注目すべきであろう。（本研究の詳細は近く別発表の予定）

Résumé

In this paper the writer dealt, first, with the developmental process of the rice embryo in detail, especially with the progress of differentiation of its various parts and the change in the size and shape at different stages from twenty-four hours after the anthesis to the maturation of the ovule into a seed, and with the relation between the development of embryo and the ripening of grain, and secondly, with the varietal difference in the embryo and its comparative morphology between the rice plant and other cereals.

For the comparative investigation amongst the cereals, the data in wheat, barley, rye and oats presented in the author's previous papers (SUETSUGU; 1950, 1951), were referred to.

The materials used in this study were prepared from plants of 18 varieties different in the growth habit or other characteristics, belonging to either of the two subsp. "Indica" and "Japonica". The microscopic study was done by means of the usual paraffin method.

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addition to them, other 32 varieties of which the embryos of dead ripened grains were sectioned by hand without fixing or staining were supplementarily for investigation of varietal differences in fully formed embryo.

The results are summarized as follows:

(1) In the material taken 24 hours after anthesis, the egg cell which had already been fertilized was divided into from 3 to 12 cells of the proembryo. These number of divided cells were found different for different varieties. In general, they were many in early ripening varieties, while were few in late varieties.

(2) In most varieties the first sign of differentiation of the rudiment of each organ in the proembryo was noticed from 3 to 4 days after anthesis, but in one late variety it was after 5 days.

(3) In most varieties, the coleoptile began to develop at that time, but in some varieties or samples, 5 days after it.

(4) The rudiment of the first foliage leaf became visible about 5 or 6 days after anthesis in almost all varieties, while in the latest one variety it was seen about 7 days after anthesis.

(5) In most varieties the rudiment of the second foliage leaf appeared about 6 or 7 days after anthesis, while in the latest variety it was seen about 9 days after anthesis.

(6) About 4 or 5 days after anthesis, the scutellum began to develop into a scute form, and the epithelial cells of the scutellum commenced to show its own shape about 10 or 11 after anthesis, in most varieties, but in the earlier varieties it was 9 days, and in the latest one, 15 days, after anthesis.

(7) The rudiment of the third foliage leaf became visible in most varieties about 11 ~15 days, but in the earliest one 9 days, and in the latest about 20 days, after anthesis.

(8) About 20~25 days after anthesis, all the organs of embryo were found to differentiate completely, attaining to the forms typical in the full ripened grains. And the varietal differences were noticed in regard to the ripening times.

(9) The stage of completion of morphological development of rice have been reported to be 10 or 14 days after anthesis by previous investigators. The writer infers that the inconsistency of those results with that of this investigation may be attributed to the improper conception of the formation of the epithelial layer of scutellum or the differentiation of the primordium of third foliage leaf by most of the previous investigators.

(10) It seemed that the length of the period from anthesis to the time of differentiation of each organs of the proembryo varied according chiefly to the temperature on and after the time of anthesis, viz. the early varieties required short periods, but the late ones required long periods in general.

(11) The growth curves of the length and thickness of embryo fromed S-shapes in the rice plant similarly as in the other cereals, but the forms of the curves showed certain variations according to the variety. The chief factors in the variation might be the time and the degree of elongation of the upper part of the scutellum.

(12) The most notable varietal differences on the developmental morphology of fully developed embryos were found in the form and angle of the scutellum—epithelial layer—development, and in the form of the coleoptile and the other rudimental leaves. Especially these differences were conspicuous between the subsp. "japonica" and "Indica".

(13) The growth of the epiblast and the ventral scale of embryo in the rice plant was very notable compared with that in other cereals. From the results of this investigation, it was considered that the epiblast and the ventral scale were both the attached organs of the scutellum, because the borders between the epiblast, ventral scale and the scutellum were invisible, viz. these organs being connected reciprocally on the both sides of longitudinal centre-axis of the ventral face of the embryo.