水稻収量予察の作物学的研究(予報)

(VI) 稔実歩合と収量予察との関係*

松島 省三・山口 俊二 (農林省農業技術研究所)

Crop-scientific studies on the yield-forecast of lowland rice (Preliminary report)

VI. On the relation of fruit bearing percentage to yield-forecast of rice.

Seizo MATHUSHIMA and Shunji YAMAGUCHI

(National Institute of Agricultural Sciences)

前報(V)の活着後2~5日おきに処理した剪葉・剪根試験(4 Blocks randomized method)の資料を用い、収量と収量構成4要素並に要素相互間の関係を検討した結果、特に稔実歩合と収量との間に、次のような注目すべき関係が得られた。(供試品種中稲農林 25 号)

(1) 先ず、稔実歩合の決定方法が問題であつたが乾燥穀として比重 1.06 より重い穀を稔実粒と認定することが、収量査定上より見て、適当且つ便宜であることが判明したので、専らこの方法によつた。

(2) 全試験区の稔実歩合と収量を夫々標準無処理区に対する百分率で表わし、稔実歩合と収量との相関を示したものが第1図(剪葉区)及び第2図(剪根区)である。第1図剪葉区の場合は第1区より第8区、第2図剪根区の場合は第1区より第10区までを除外すれば、収量と稔実歩合との間には夫々極めて強い正の相関(共に $r=0.99^{***}$)が認められる。この両図を通じて共通に結論し得ることは、第11区(8月26日、出穂期前5日)以降に於ては、収量は殆ど専ら稔実歩合によつて左右されると断じ得られる点である。第11区の

Fig. 1—Pruning treatment on blades.

Fig. 2—Pruning treatment on roots.

Note: 1. Numerals in Fig. 1 and 2 represent numbers of plots.

2. Each plot was treated on following date (days from heading; heading date of "Control" was Aug. 31); No. 1 (-47 days), No. 2 (-42 days), No. 3 (-37 days), No. 4 (-32 days), No. 5 (-27 days), No. 6 (-22 days), No. 7 (-18 days), No. 8 (-13 days), No. 9 (-9 days), No. 10 (-7 days), No. 11 (-5 days), No. 12 (-2 days), No. 13 (3 days), No. 14 (8 days), No. 15 (14 days), No. 16 (18 days), No. 17 (23 days), No. 18 (28 days), No. 19 (33 days), No. 20 (38 days), No. 21 (43 days), No. 22 (48 days), No. 23, 24 (55 days, control).

出穂期前5日の時期は、既報のように、恰も平均一穂顕花数の決定終止期であり、この時期以降の各区の顕花数には両試験区とも全く有意差が認められない。なお、穂数は第7区(8月13日、生殖細胞形成始期)以降の各区間には有意差が見られないので、結局第11区の時期には既に穂数並に一穂顕花数が決定し終わっていると考へてよい。従つて、穂数並に顕花数が決定し終つた後に於ては、収量を決定する主役は稔実歩合であると断じ得られよう。

(3) 収量は4要素の相乗積で表わされ、穂数・平均一穂顕花数が決定された後に於ては、収量は未決定の稔実歩合と千粒重の2要素によつて左右される筈である。しかるに、上述のように殆ど専ら稔実歩合のみによつて収量が左右される事實は、次のように玄米千粒重の変異の小さな点に、その理由が求められよう。即ち、第1表は両処理区の全区に就いて

* 昭和 27 年 4 月 1 日 第 95 回講演会に於て発表

収量構成 4 要素の変異係数を示したものであるが、本試験のように生育各期に致命的な障害を与えた場合に於てさえ、千粒重の変異は極めて小さい。この事は前報 (1), 岩槻 (1931) 及び野津原 (1952) 等からも裏付けられる。

Table 1. Coefficients of variability (%) of 4 factors constituting yield in the experiment of pruning blades or roots in different growing stages in rice.

Treatment	No. of ears per plant	No. of spikelets per ear	Fruit bearing %	Weight of 1,000 grains	Yield
Pruning blade	17.4	17.2	41.5	4.2	54.2
Pruning root	13.1	18.6	21.3	4.7	30.6

Note: Plots used are 24×4 in each treatment.

(4) 以上の結果から、水稻収量予測上の焦眉の問題点が稔実歩合の早期予知にある事が判明した。然るに完全不稔穀は出穂後間もなく認知出来るので、問題の焦点は比重 1.06 以下の发育停止穀の予知にあらう。

(文献省略)

Summary

Following significant relation between fruit bearing percentage and yield of rice was drawn out from the data, formerly reported on the experiments of pruning blades and roots in rice plant.

(1) In this study, first of all, it was very necessary to establish an index by means of which fruited grains can be scientifically distinguished. As a result of researching the index from the stand-point of estimating rice yield, it was ascertained to be recommendable to use specific gravity of grains as the index and to take heavier grains than 1.06 of specific gravity as fruited ones. But this index holds true only in the case of dry grains (water content 12~15%).

(2) Correlation tables between fruit bearing percentage and yield, represented in percentage to the "Controls" respectively, are given in Fig. 1 and Fig. 2. Fruit bearing percentage can be seen to be very highly correlated with yield ($r=0.99^{***}$), except for the plots of No. 1~8 in Fig. 1 and No. 1~10 in Fig. 2. These two figures strongly suggest that in the period, at the latest, after the treatment date of No. 11 (Aug. 26, 5 days before heading), the yield of rice is mainly affected only by the fruit bearing percentage. The time of treatment on No. 11 is just the end of period when number of spikelets per ear increases, as seen in the former report (V), and there are no significant differences in number of spikelets per ear among all plots treated after it. Moreover, no significant differences are found in number of ears per plant among plots treated No. 7 (Aug. 13, beginning of reproductive cell formation). Therefore, we can likely conclude that after the number of spikelets per ear and ears per plant are determined, fruit bearing percentage plays a leading role in determining the amount of rice-yield.

(3) As the yield of rice is represented by the product of its constitutional four factors, in the period after the number of ears per plant and spikelets per ear are determined it is controlled by two factors — fruit bearing percentage and weight of 1,000 grains — which are not yet determined. In fact, however, the yield of rice, as mentioned above, is mainly affected only by fruit bearing percentage in that period. The reason why weight of 1,000 grains has very little to do with constituting yield can be explained by its small variability. For example, Table 1 showing coefficients of variability of four factors indicates obviously that weight of 1,000 grains is remarkably small in variability as compared with other three factors. And there are several further data supporting the stability of it.

(4) From the results mentioned above, it has been made clear that one of the most important keys to solve the problem of yield-forecast in rice is to forecast the fruit bearing percentage as early as possible. Moreover, as entirely sterile grains can be recognized by the time shortly after heading, it seems to be the most urgent problem to forecast the percentage of lighter grains than 1.06 in specific gravity.