110. Agro-physiological Studies on Low-tillering Rice : an Ideotype for Increasing Grain Yield Potential.

II. Contribution of Different Tillers Within a Plant on Grain Yield and Yield Components.

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Objective : To study the contribution of different tillers on the sink (grain yield) and source size, and the location of bigger panicles within a plant in relation to an ideotype of rice.

Materials and Methods : IR25588 and IR58 were sown in seedling trays in 1987 dry season, IRRI. One 10-day-old seedling was tranplanted per 1/5,000a pot by completely randomized design with 22 replications. Emergence of the different tillers was recorded separately and the tillers were marked with plastic labels and colored thread every two day.

Results and Discussion :

1) The top six tillers had much higher weight and more spikelets per panicle than those of other panicles in IR25588 and IR58. The top six tillers were the main culm ; the first, second, third and fourth primary tillers ; and the first secondary tiller from the second primary tiller (M, Pl, P2, P3 P4 & S1P2) in both varieties (Fig.1&2). The top six panicles based on grain weight was mainly due to high spikelet number per panicle (Table 1).

2) The top six tillers were initiated and flowered earlier than the other tillers. The top six tillers had bigger culm and leaves per tiller than the rest of the tillers (Table 2).

3) The top six tillers had more inner and outer vascular bundles, and also bigger culm diameter and culm thickness at just below the neck node of panicles (Table 3).

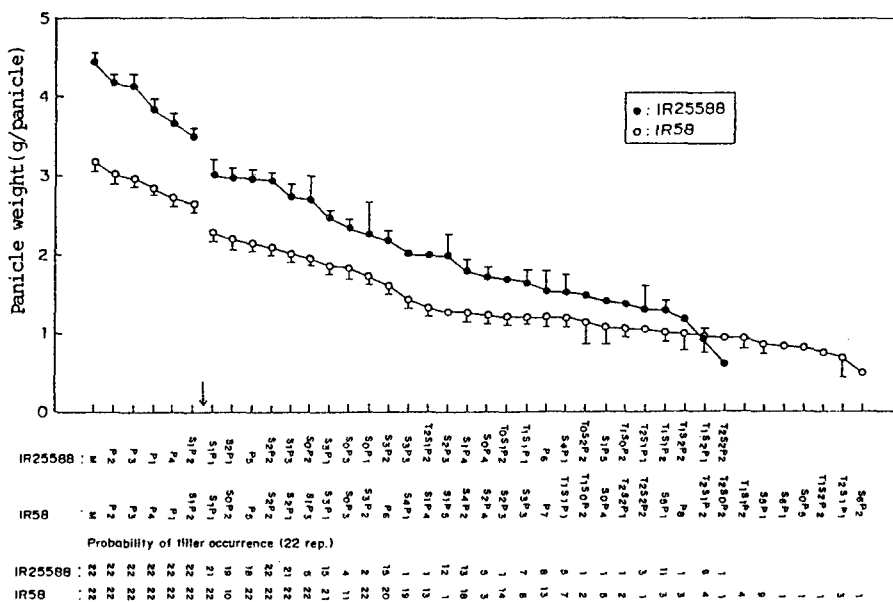This results suggest a new rice ideotype of six tillers per plant for increasing grain yield potential.

Fig. 1 . Variation of panicle weight on different tillers of a plant in IR25588 and IR58 (vertical bars indicate standard error). IRRI, 1987 DS.
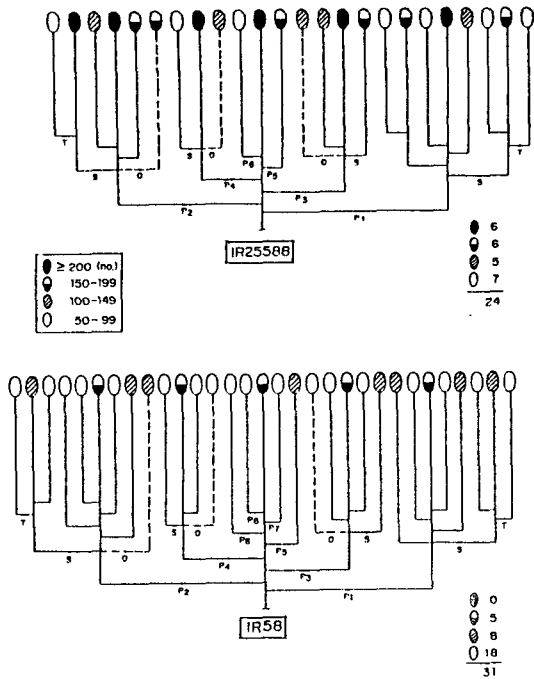
Fig. 2. Location of different grades of panicles in a plant of IR25588 and IR58 based on spikelet number per panicle. IRRI, 1987 DS.

Table 2. Leaf area and total dry weight per tiller of different tillers at heading, IRRI, 1987 DS.

Tiller	IR25588 Leaf area (cm²)	IR25588 Total dry weight (g)	IR58 Leaf area (cm²)	IR58 Total dry weight (g)
M*	302±10[a]	3.89±0.1	250±10	3.15±0.1
P1*	352± 5	3.54±0.1	259± 8	2.81±0.1
P2*	301±10	3.83±0.1	248± 9	2.86±0.1
P3*	301± 6	3.44±0.1	230± 9	2.74±0.1
P4*	278± 5	3.11±0.1	232± 7	2.82±0.1
P5	209±18	2.06±0.2	225± 6	2.25±0.1
P6	147±20	1.36±0.2	167± 6	1.55±0.1
S1P1	235±17	2.36±0.2	220± 9	2.16±0.1
S2P1	242±11	2.36±0.1	209± 9	1.98±0.1
S3P1	218± 5	1.97±0.1	190±10	1.67±0.1
S4P1	142±24	1.30±0.2	154±10	1.18±0.1
S1P2*	258± 7	3.02±0.1	231± 7	2.52±0.1
S2P2	225± 6	2.46±0.1	213± 7	2.04±0.1
S3P2	185±11	1.88±0.1	187± 7	1.71±0.1
S1P3	213± 5	2.08±0.1	167±17	1.77±0.1
S2P3	179±18	1.44±0.1	154± 7	1.11±0.1
S1P4	160±14	1.27±0.1	123±13	1.11±0.1
T1S1P1	123±28	0.83±0.2	121±24	0.78±0.1
T2S1P1	191±19	1.42±0.1	71±14	0.50±0.1
T1S1P2	127±18	0.86±0.1	69±11	0.44±0.1

* The top six tillers.   [a]Mean ± standard error.

Table 1. Grain yield and spikelet number per panicle of different tillers. IRRI, 1987 DS.

Tiller	IR25588 Grain wt. (g/panicle)	IR25588 Spikelet (no./panicle)	IR58 Grain wt. (g/panicle)	IR58 Spikelet (no./panicle)
M*	4.46±0.1[a]	247±7.2	3.18±0.1	172±3.9
P1*	3.83±0.1	216±7.7	2.72±0.1	155±4.3
P2*	4.17±0.1	245±7.0	3.03±0.1	169±4.7
P3*	4.16±0.1	233±6.6	2.95±0.1	160±4.8
P4*	3.66±0.1	204±6.1	2.85±0.1	155±4.4
P5	2.95±0.1	169±8.1	2.16±0.1	117±4.2
P6	1.50±0.3	82±13.4	1.60±0.1	89±4.7
S1P1	3.03±0.2	172±11.4	2.28±0.1	125±5.3
S2P1	2.97±0.1	171±9.0	2.04±0.1	115±4.5
S3P1	2.46±0.1	142±5.2	1.86±0.1	104±4.1
S4P1	1.50±0.2	90±18.5	1.41±0.1	81±3.8
S1P2*	3.51±0.1	200±5.4	2.65±0.1	144±4.7
S2P2	2.94±0.1	169±6.5	2.11±0.1	121±5.0
S1P2	2.17±0.1	123±6.1	1.72±0.1	97±1.4
S1P3	2.73±0.1	157±8.7	1.94±0.1	102±4.1
S2P3	1.97±0.2	118±13.0	1.23±0.1	72±6.1
S1P4	1.77±0.1	97±7.9	1.32±0.1	72±5.7
T1S1P1	1.63±0.2	90±10.7	1.18±0.1	68±6.8
T2S1P1	1.31±0.3	70±15.6	0.68±0.2	61±10.8
T1S1P2	1.29±0.1	75±6.8	1.94±0.1	56±9.2

* The top six tillers.   [a]Mean ± standard error.

Table 3. Number of inner and outer vascular bundles in different tillers. IRRI, 1987 DS.

Tiller	IR25588 Inner vascular bundle (no.)	IR25588 Outer vascular bundle (no.)	IR58 Inner vascular bundle (no.)	IR58 Outer vascular bundle (no.)
M*	24.4±0.6[a]	23.0±1.0	22.0±0.6	22.0±0.4
P1*	23.6±0.6	24.2±1.1	22.1±0.7	21.8±1.1
P2*	23.2±0.3	24.6±1.2	22.2±0.8	21.2±0.7
P3*	22.0±0.4	23.8±1.2	21.4±0.4	20.2±0.8
P4*	21.2±0.4	23.8±0.9	21.0±0.4	20.6±0.6
P5	21.3±0.4	21.0±1.0	19.2±0.9	19.6±1.3
P6	18.0±0.5	21.0±1.2	18.2±0.2	17.3±1.1
S1P1	21.2±0.7	22.8±0.9	19.0±0.7	18.8±1.3
S2P1	20.4±0.5	23.0±1.0	18.6±0.8	17.6±1.1
S3P1	20.4±0.6	20.8±1.2	17.0±0.8	18.0±1.0
S1P2*	21.2±0.3	23.2±0.9	20.4±0.6	19.8±0.3
S2P2	20.8±0.4	22.2±1.2	18.6±0.9	18.6±0.8
S3P2	20.0±0.9	20.0±1.0	18.0±1.0	17.3±1.7
S1P3	20.3±0.6	20.3±0.8	18.2±1.0	18.2±1.2
T1S1P1	18.6±0.8	18.8±0.4	15.0±0.7	15.0±0.5
T2S1P1	18.2±0.9	18.7±0.6	15.5±0.2	15.0±1.2

* The top six tillers.   [a]Mean ± standard error.