Morphological Characters of the Cultivated Rice Grains of Fiji

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Introduction

In the 1982 academic year, the Kagoshima University Research Center for the South Pacific carried out the second-years's research in Fiji and Solomon Islands. This project examined the ecological, ethnological and bio-productive features of the natural environment, as well as the resources in Fiji and Solomon Islands. The present author was attended for research the agricultural sciences, *i.e.*, agricultural productivity, cultural patterns, pathological and physiological condition, land-use practices in tropical areas.

As a part of the project, 20 strains of cultivated rice, *Oryza sativa* L., using in Fiji were collected. The most of them were delivered him through the kindness of Dr. S. A. Haque, and some of them were directly collected in the fields by the members of the party. The grains of these strains were used for the morphological studies. The main purpose are to clarify the varietal variations and the phylogenetic relationships of the cultivated-rice-strains using in the south Pacific areas.

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Materials and Methods

Twenty strains of cultivated rice collected in Fiji were used in the experiment. They are listed up in Table 1. In this table, strain number, ordinary sowing and harvesting times and remarks are mentioned. Measurements were done for length, width and thickness of the unhusked and husked grains. Thirty grains were used for the measurements. The measurements were done at the largest portion of the respective characters. Calculations were done for determining the ratios of length to width, of length to thickness and of width to thickness. The variation ranges referring to the 12 characters were illustrated by the maximum, the minimum and the pure-range-values in

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Table 1. Locality, some characters of cultivated rice, *Oryza sativa* L., collected in Fiji

Strain No.	Stock No.	Variety name	Original place	Ordinary sowing time	Harvesting time	Remarks
1	923	Bhallu	Koroqara, Nausori	Oct/Nov	Feb	Traditional
2	924	Uttam	Koronivia	Non-seasonal	Non-seasonal	Improved
3	925	Chetua	Visama, Nausori	Oct/Nov	May/April	Traditional
4	926	New Guinea	Nasasa, Navua	Non-seasonal	Non-seasonal	Traditional
5	927	Lalka Motka	Navua	Oct/Nov	May/April	Traditional
6	928	China Patta	Navua	Oct/Nov	May/April	Traditional
7	929	Jinka	Navua	Oct/Nov	April/May	Traditional
8	930	Saraya	Nausori	Oct/Nov	April/May	Traditional
9	931	Ram Kajara	Koronivia, Nausori	Oct/Nov	April/May	Traditional
10	932	BG75	Lokia, Nausori	Oct/Nov	April/May	Traditional
11	933	BG79	Koronivia	Oct/Nov	April/May	Traditional
12	934	Bold grain	Koronivia	Non-seasonal	Non-seasonal	Improved
13	935	Ajral	Koronivia	Non-seasonal	Non-seasonal	Traditional
14	936	Bilo	Koronivia	Non-seasonal	Non-seasonal	Traditional
15	937	Japanese	Ra, Nausori	Oct/Nov	April/May	Traditional
16	938	K109-27-1	Koronivia	Non-seasonal	Non-seasonal	Improved
17	939	—	Nausori	—	—	Traditional
18	940	—	Dreketi	—	—	Traditional
19	941	—	Dreketi	—	—	Traditional
20	942	—	Dreketi	—	—	Traditional

the whole grains.

In this paper, the following abbreviations were used, L (length), W (width), T (thickness), L/W (ratio of length to width), L/T (ratio of length to thickness), W/T (ratio of width to thickness), s.d. (standard deviations), max. (maximum) and min. (minimum).

Results

PART I. The respective characters

1. Length of unhusked grains

The results are given in Table 2. Lengths for the individual grain level ranged from 10.50 mm (strain Nos.12 and 13) to 7.10 mm (Nos. 6 and 10). In the strain level, longest (9.86 mm) was obtained in No.13, followed by No.12 (9.85 mm) and No.18 (9.75 mm). The shortest (7.63 mm) was noted in No.10, followed by No.15 (7.69 mm) and No.6 (7.70 mm). Average and its s.d. through the whole strains were found to be 8.71 ± 0.74. The s.d. of each strain, *i.e.*, showing intra-population's variations,

Table 2. Six morphological characters of the unhusked grains

Strain No.	Length (mm)	Width (mm)	Thickness (mm)	L/W	L/T	W/T
1	9.22±0.18	3.13±0.10	2.05±0.07	2.95±0.11	4.50±0.15	1.53±0.07
2	8.47±0.20	2.64±0.09	1.93±0.04	3.21±0.14	4.39±0.13	1.37±0.06
3	8.26±0.18	3.02±0.10	2.10±0.09	2.74±0.12	3.94±0.16	1.44±0.07
4	9.11±0.29	2.77±0.14	2.13±0.08	3.30±0.19	4.31±0.20	1.31±0.08
5	8.81±0.25	3.24±0.11	2.22±0.07	2.72±0.10	3.98±0.14	1.46±0.06
6	7.70±0.24	2.74±0.04	2.05±0.04	2.70±0.08	3.76±0.09	1.34±0.02
7	8.60±0.27	3.40±0.12	2.25±0.08	2.53±0.09	3.82±0.16	1.51±0.07
8	8.96±0.25	2.84±0.13	2.12±0.08	3.16±0.17	4.24±0.17	1.35±0.09
9	8.00±0.23	3.00±0.11	2.19±0.08	2.67±0.09	3.65±0.15	1.37±0.06
10	7.63±0.23	2.48±0.08	1.93±0.03	3.08±0.04	3.96±0.12	1.29±0.03
11	8.37±0.12	2.73±0.11	2.01±0.06	3.07±0.12	4.17±0.14	1.36±0.07
12	9.85±0.29	3.16±0.10	2.26±0.07	3.12±0.14	4.36±0.17	1.40±0.07
13	9.86±0.30	2.82±0.07	2.11±0.06	3.50±0.13	4.67±0.19	1.33±0.05
14	7.84±0.23	2.81±0.10	1.97±0.07	2.79±0.09	3.99±0.12	1.43±0.06
15	7.69±0.17	2.99±0.10	1.90±0.07	2.58±0.10	4.07±0.16	1.58±0.08
16	9.55±0.38	2.74±0.11	2.03±0.07	3.49±0.20	4.71±0.19	1.35±0.08
17	9.62±0.32	3.16±0.09	2.26±0.07	3.06±0.14	4.26±0.19	1.39±0.06
18	9.75±0.37	3.19±0.10	2.25±0.08	3.06±0.17	4.33±0.21	1.42±0.06
19	8.23±0.25	3.26±0.12	2.22±0.09	2.53±0.09	3.71±0.15	1.47±0.08
20	8.62±0.30	3.79±0.06	2.31±0.09	2.28±0.09	3.74±0.19	1.63±0.07

obtained were found to be 0.25 ± 0.06.

2. Width of unhusked grains

Widths for the individual grain level ranged from 3.90 mm (No.20) to 2.30 mm (No.10). In the strain level, the widest (3.79 mm) was obtained in No.20, followed by No.7 (3.40 mm) and No.19 (3.26 mm). It was noticeable that No.20 showed very large value. The narrowest (2.48 mm) was noted in No.10, which was the same as in case of L, followed by No.2 (2.64 mm) and No.11 (2.73 mm). Average and its s.d. through the whole strains were found to be 3.00 ± 0.30. S. d. of each strain were found to be 0.10 ± 0.02.

3. Thickness of unhusked grains

Thicknesses for the individual grain level ranged from 2.55 mm (No.20) to 1.80 mm (Nos.10, 14 and 15). In the strain level, the thickest (2.31 mm) was obtained in No. 20, which was the same as in case of W, followed by Nos.12 and 17 (2.26 mm). The thinnest (1.90 mm) was noted in No.15, followed by Nos.2 and 10 (1.93 mm). Average and its s.d. through the whole strains were found to be 2.12 ± 0.12. S.d. of each strain were found to be 0.07 ± 0.02.

4. L/W of unhusked grains

L/W for the individual grain level ranged from 4.00 (No.16) to 2.08 (No.20). In

Table 3. Six morphological characters of the husked grains

Strain No.	Length (mm)	Width (mm)	Thickness (mm)	L/W	L/T	W/T
1	6.64±0.19	2.65±0.09	1.85±0.07	2.51±0.10	3.56±0.19	1.44±0.08
2	5.96±0.14	2.21±0.06	1.73±0.04	2.69±0.11	3.45±0.11	1.28±0.05
3	5.84±0.13	2.52±0.07	1.90±0.09	2.32±0.08	3.08±0.15	1.33±0.08
4	6.56±0.18	2.41±0.10	1.92±0.08	2.73±0.14	3.42±0.16	1.25±0.08
5	6.25±0.14	2.67±0.07	2.00±0.07	2.34±0.06	3.12±0.11	1.34±0.06
6	5.51±0.18	2.09±0.07	1.76±0.08	2.64±0.08	3.14±0.12	1.19±0.04
7	6.00±0.18	2.80±0.12	2.04±0.09	2.14±0.08	2.94±0.14	1.37±0.07
8	6.54±0.18	2.47±0.07	1.91±0.07	2.65±0.10	3.42±0.14	1.29±0.06
9	5.70±0.16	2.60±0.10	2.00±0.08	2.19±0.07	2.85±0.12	1.30±0.07
10	5.35±0.10	2.00±0.05	1.83±0.03	2.68±0.02	2.94±0.02	1.10±0.02
11	5.93±0.11	2.27±0.10	1.80±0.05	2.62±0.12	3.27±0.15	1.27±0.07
12	6.74±0.17	2.64±0.10	2.04±0.08	2.56±0.11	3.32±0.14	1.30±0.07
13	7.04±0.22	2.38±0.06	1.91±0.06	2.96±0.11	3.70±0.14	1.25±0.05
14	5.54±0.19	2.38±0.07	1.77±0.07	2.33±0.09	3.14±0.12	1.34±0.06
15	5.66±0.10	1.88±0.10	1.46±0.04	3.04±0.08	3.87±0.09	1.29±0.07
16	6.95±0.27	2.35±0.07	1.82±0.07	2.96±0.14	3.82±0.16	1.30±0.07
17	6.65±0.23	2.65±0.06	2.05±0.08	2.51±0.12	3.25±0.17	1.30±0.07
18	6.73±0.22	2.68±0.13	2.04±0.08	2.52±0.16	3.30±0.16	1.31±0.08
19	5.84±0.17	2.75±0.11	2.02±0.09	2.12±0.07	2.89±0.13	1.37±0.08
20	5.69±0.16	3.07±0.12	2.08±0.06	1.86±0.09	2.75±0.11	1.48±0.04

the strain level, the largest (3.50) was obtained in No.13, which was the same as in case of L, followed by No.16 (3.49) and No.4 (3.30). The smallest (2.28) was noted in No. 20, followed by Nos.7 and 19 (2.53). Average and its s.d. through the whole strains were found to be 2.93 ± 0.32. S.d. of each strain were found to be 0.12 ±0.04.

5. L/T of unhusked grains

L/T for the grain level ranged from 5.00 (No.13 and 16) to 3.31 (No.9). In the strain level, the largest (4.71) was obtained in No.16, followed by No.13 (4.67) and No. 1 (4.50). The smallest (3.65) was noted in No.9, followed by No.19 (3.71) and No.20 (3.74). Average and its s.d. through the whole strains were found to be 4.13 ± 0.31. S.d. of each strain were found to be 0.16 ± 0.03.

6. W/T of unhusked grains

W/T for the grain level ranged from 1.76 (No.20) to 1.13 (No.4). In the strain level, the largest (1.63) was obtained in No.20, which was the same as in cases of W and T, followed by No.15 (1.58) and No.1 (1.53). The smallest (1.29) was noted in No.10, which was the same as in cases of L and W, followed by No.4 (1.31) and No.13 (1.33). Average and its s.d. through the whole strains were found to be 1.42 ± 0.09. S.d. of each strain were found to be 0.07 ± 0.02.

7. Length of husked grains

The results are given in Table 3. Lengths for individual grain level ranged from 7.40 mm (No.13) to 5.05 mm (No.10). In the strain level, the longest (7.04 mm) was obtained in No.13, which was the same as in cases of L and L/W of the unhusked grains, followed by No.16 (6.95 mm) and No.12 (6.74 mm). The shortest (5.35 mm) was noted in No.10, which was the same as in cases of L, W and W/T of the unhusked grains, followed by No.6 (5.51 mm) and No.14 (5.54 mm). Average and its s.d. through the whole strains were found to be 6.16 ± 0.52. S.d. of each strain were found to be 0.17 ± 0.04.

8. Width of husked grains

Widths for individual grain level ranged from 3.25 mm (No.20) to 1.75 mm (No. 15). In the strain level, the widest (3.07 mm) was obtained in No.20, which was the same as in cases of W, T and W/T of the unhusked grains, followed by No.7 (2.80 mm) and No.19 (2.75 mm). These orders of strains were found to be the same as in case of W of the unhusked grains. The narrowest (1.88 mm) was noted in No.15, which was the same as in case of T of the unhusked grains, followed by No.10 (2.00 mm) and No. 6 (2.06 mm). Average and its s.d. through the whole strains were found to be 2.47 ± 0.28. S.d. of each strain were found to be 0.09 ± 0.02.

9. Thickness of husked grains

Thicknesses for individual grain level ranged from 2.20 mm (Nos.17, 18, 19 and 20) to 1.30 mm (No.15). In the strain level, the thickest (2.08 mm) was obtained in No.20, which was the same as in cases of W, T and W/T of the unhusked grains and W of the husked grains, followed by No.17 (2.05 mm) and Nos.12 and 18 (2.04 mm). These combinations of strains were found to be the same as in case of T of the unhusked grains. The thinnest (1.46 mm) was noted in No.15, which was the same as in cases of T of the unhusked grains and W of the husked grains, followed by No.2 (1.73 mm) and No.6 (1.76 mm). It was noted that the value was peculiarly small in No.15. Average and its s.d. through the whole strains were found to be 1.90 ± 0.15. S.d. of each strain were found to be 0.07 ± 0.02.

10. L/W of husked grains

L/W for individual grain level ranged from 3.24 (No.16) to 1.71 (No.20). In the grain level, the largest (3.04) was obtained in No.15, followed by Nos.13 and 16 (2.96). The smallest (1.86) was noted in No.20, which was the same as in case of L/W of the unhusked grains, followed by No.19 (2.12) and No.7 (2.14). It was noted that the value was peculiarly small in No.20. These combinations of strains were found to be the same as in case of L/W of the unhusked grains. Average and its s.d. through the whole strains were found to be 2.50 ± 0.30. S.d. of each strain were found to be 0.10 ± 0.03.

11. L/T of husked grains

L/T of individual grain level ranged from 4.09 (No.16) to 2.52 (No.20). In the strain level, the largest (3.87) was obtained in No.15, which was the same as in case of L/W of the husked grains, followed by No.16 (3.82) and No.13 (3.70). These combinations of strains were found to be the same as in case of L/W of the husked grains. The smallest (2.75) was noted in No.20, which was the same as in case of L/W of the

unhusked and the husked grains, followed by No.9 (2.85) and No.19 (2.89). These combinations of strains were found to be the same as in case of L/T of the unhusked grains. Average and its s.d. through the whole strains were found to be 3.26 ± 0.31. S. d. of each strain were found to be 0.13 ± 0.04.

12. W/T of husked grains

W/T of individual grain level ranged from 1.64 (No.3) to 1.05 (No.10). In the strain level, the largest (1.48) was obtained in No.20, which was the same as in cases of W, T and W/T of the unhusked grains and W and T of the husked grains, followed by No.1 (1.44) and Nos.7 and 19 (1.37). The smallest (1.10) was noted in No.10, which was the same as in cases of L, W and W/T of the unhusked grains and L of the husked grains, followed by Nos.4 and 13 (1.25). It was noted that the value was peculiarly small in No.10. Average and its s.d. through the whole strains were found to be 1.31 ± 0.08. S. d. of each strain were found to be 0.06 ± 0.02.

PART II. Ranges among the respective characters

1. Length of unhusked grains

Maximum : The results are given in Table 4. In the table, the maximum, the minimum and their range are shown. The longest (10.50 mm) was obtained Nos.12 and 13, followed by Nos.17 and 18 (10.30 mm). The shortest (8.10 mm) was noted in No.6, followed by Nos.10 and 15 (8.15 mm). Average and its s.d. through the whole strains were found to be 9.22 ± 0.80.

Minimum : The longest (9.40 mm) was obtained in Nos.12 and 13, which were the same as in case of the maximum, followed by Nos.1 and 18 (8.90 mm). The shortest (7. 10 mm) was noted in Nos.6 and 10, followed by No.15 (7.15 mm). These combinations of strains were found to be the same as in case of the maximum of L. Average and its s.d. through the whole strains were found to be 8.19 ± 0.69.

Range : The largest (1.50 mm) was obtained in No.17, followed by No.18 (1.40 mm) and Nos.16 and 20 (1.25 mm). The smallest (0.50 mm) was noted in No.11, followed by Nos.1 and 3 (0.70 mm). Average and its s.d. through the whole strains were found to be 1.03 ± 0.24.

2. Width of unhusked grains

Maximum : The widest (3.90 mm) was obtained in No.20, followed by No.7 (3.60 mm) and No.19 (3.50 mm). The narrowest (2.65 mm)was noted in No.10, followed by Nos.2, 6 and 13 (2.90 mm). Average and its s.d. through the whole strains were found to be 3.19 ± 0.29.

Minimum : The widest (3.60 mm) was obtained in No.20, which was the same as in case of the maximum, followed by No.7 (3.20 mm) and Nos.5 and 19 (3.10 mm). The narrowest (2.30 mm) was noted in No.10, which was the same as in case of the maximum, followed by Nos.2, 11 and 16 (2.50 mm). Average and its s.d. through the whole strains were found to be 2.81 ± 0.30.

Table 4. Ranges of the unhusked grains in the strain level; length (mm), width (mm), thickness (mm), ratio of length to width (%), ratio of length to thickness (%) and ratio of width to thickness (%)

Strain No.	Length			Width			Thickness			Length/Width			Length/Thickness			Width/ Thickness		
	Max.	Min.	Range	Max.	Min.	Range	Max.	Min.	Range	Max.	Min.	Range	Max.	Min.	Range	Max.	Min.	Range
1	9.60	8.90	0.70	3.30	3.00	0.30	2.20	1.90	0.30	3.18	2.76	0.42	4.87	4.16	0.71	1.68	1.43	0.25
2	9.00	8.15	0.85	2.90	2.50	0.40	2.00	1.90	0.10	3.42	2.86	0.56	4.68	4.18	0.50	1.57	1.28	0.29
3	8.60	7.90	0.70	3.20	2.80	0.40	2.25	1.90	0.35	3.00	2.55	0.45	4.32	3.67	0.56	1.63	1.32	0.31
4	9.20	8.50	1.20	3.00	2.55	0.45	2.30	1.95	0.35	3.71	3.00	0.71	4.75	3.95	0.80	1.43	1.13	0.30
5	9.50	8.30	1.20	3.45	3.10	0.35	2.30	2.05	0.25	3.06	2.57	0.49	4.32	3.76	0.56	1.57	1.35	0.22
6	8.10	7.10	1.00	2.90	2.60	0.30	2.20	1.90	0.30	3.01	2.60	0.41	4.05	3.45	0.60	1.47	1.21	0.26
7	9.10	8.10	1.00	3.60	3.20	0.40	2.40	2.10	0.30	2.81	2.25	0.56	4.16	3.48	0.68	1.66	1.37	0.29
8	9.50	8.45	1.05	3.10	2.60	0.50	2.25	1.90	0.35	3.52	2.79	0.73	4.67	3.95	0.72	1.59	1.23	0.36
9	8.50	7.50	1.00	3.20	2.80	0.40	2.35	2.05	0.30	2.95	2.39	0.56	3.99	3.31	0.68	1.52	1.23	0.29
10	8.15	7.10	1.05	2.65	2.30	0.35	2.05	1.80	0.25	3.32	2.84	0.48	4.28	3.64	0.64	1.41	1.16	0.25
11	8.60	8.10	0.50	3.00	2.50	0.50	2.15	1.90	0.25	3.32	2.78	0.54	4.45	3.79	0.66	1.54	1.19	0.35
12	10.50	9.40	1.10	3.35	3.00	0.35	2.35	2.10	0.25	3.50	2.94	0.56	4.79	4.09	0.70	1.56	1.28	0.28
13	10.50	9.40	1.10	2.90	2.70	0.20	2.25	2.00	0.25	3.78	3.24	0.54	5.00	4.29	0.71	1.41	1.23	0.18
14	8.30	7.50	0.80	3.00	2.65	0.35	2.10	1.80	0.30	2.96	2.66	0.30	4.17	3.71	0.46	1.54	1.33	0.21
15	8.15	7.15	1.00	3.10	2.75	0.35	2.15	1.80	0.35	2.81	2.35	0.46	4.36	3.65	0.71	1.72	1.40	0.32
16	10.00	8.75	1.25	3.00	2.50	0.50	2.15	1.85	0.30	4.00	3.02	0.98	5.00	4.27	0.73	1.62	1.22	0.40
17	10.30	8.80	1.50	3.25	3.00	0.25	2.40	2.15	0.25	3.42	2.75	0.67	4.59	3.88	0.71	1.49	1.28	0.21
18	10.30	8.90	1.40	3.40	3.00	0.40	2.40	2.10	0.30	3.42	2.70	0.72	4.88	3.96	0.92	1.55	1.32	0.33
19	8.80	7.90	0.90	3.50	3.10	0.40	2.40	2.00	0.40	2.65	2.35	0.30	4.00	3.38	0.62	1.62	0.29	0.33
20	9.15	7.90	1.25	3.90	3.60	0.30	2.55	2.10	0.45	2.50	2.08	0.42	4.19	3.43	0.76	1.76	1.49	0.27

Range : The largest (0.50 mm) was obtained in Nos.8,11 and 16. The smallest (0.20 mm) was noted in No.13, followed by No.17 (0.25 mm) and Nos.1, 6 and 20 (0.30 mm). Average and its s.d. through the whole strains were found to be 0.37 ± 0.08.

3. Thickness of unhusked grains

Maximum : The thickest (2.55 mm) was obtained in No.20, which was the same as in cases of the maximum and the minimum of W, followed by Nos.7, 17, 18 and 19 (2.40 mm). The thinnest (2.00 mm) was noted in No.2, followed by No.10 (2.05 mm) and No.14 (2.10 mm). Average and its s.d. through the whole strains were found to be 2.26 ± 0.14.

Minimum : The thickest (2.15 mm) was obtained in No.17, which was the same as in case of the range of L, followed by Nos. 7, 12, 18 and 20 (2.10 mm). Tke thinnest (1.80 mm) was noted in Nos. 10, 14 and 15. Average and its s. d. through the whole strains were found to be 1.96 ± 0.11.

Range : The largest (0.45 mm) was obtained in No.20, which was the same as in cases of the maxima of W and T and the minimum of W, followed by No.19 (0.40 mm) and Nos.3, 4, 8 and 15 (0.35 mm). The smallest (0.10 mm) was noted in No.2. Average and its s.d. through the whole strains were found to be 0.30 ± 0.07.

4. L/W of unhusked grains

Maximum : The largest (4.00) was obtained in No.16, followed by No.13 (3.78) and No.4 (3.71). It may be noticed that the value was peculiarly large in No.16. The smallest (2.50) was noted in No.20, followed by No.19 (2.65) and Nos.7 and 15 (2.81). Average and its s. d. through the whole strains were found to be 3.22 ± 0.38.

Minimum : The largest (3.24) was obtained in No.13, followed by No.16 (3.02) and No.4 (3.00). These combinations of strains were found to be the same as in case of the maximum of L/W. The smallest (2.08) was noted in No.20, which was the same as in case of the maximum of L/W, followed by No.7 (2.25) and Nos.15 and 19 (2.35). These combinations of strains were found to be the same as in case of the maximum of L/W. Average and its s.d. through the whole strains were found to be 2.67 ± 0.28.

Range : The largest (0.98) was obtained in No.16, followed by No.8 (0.73) and No. 18 (0.72). It may be noticed that the value was peculiarly large in No.16, which was the same as in case of the maximum of L/W. The smallest (0.30) was noted in Nos. 14 and 19, followed by No.6 (0.41). Average and its s.d. through the whole strains were found to be 0.54 ± 0.16.

5. L/T of unhusked grains

Maximum : The largest (5.00) was obtained in Nos.13 and 16, followed by No.18 (4.88). The smallest (3.99) was noted in No. 9, followed by No. 19 (4.00) and No. 6 (4.05). Average and its s. d. through the whole strains were found to be 4.48 ± 0.33.

Minimum : The largest (4.29) was obtained in No.13, which was the same as in case of the minimum of L/W, followed by No.6 (4.27) and No.2 (4.18). The smallest (3.31) was noted in No.9, which was the same as in case of the maximum of L/T, followed by No.19 (3.38) and No.20 (3.43). Average and its s.d. through the whole strains were found to be 3.80 ± 0.30.

Range : The largest (0.92) was obtained in No.18, followed by No.4 (0.80) and No. 20 (0.76). The smallest (0.46) was noted in No.14, followed by No.2 (0.50) and Nos. 3 and 5 (0.56). Average and its s.d. through the whole strains were found to be 0.67 ± 0.10.

6. W/T of unhusked grains

Maximum : The largest (1.76) was obtained in No.20, which was the same as in cases of the maxima of W and T, the minimum of W and the range of T, followed by No. 15 (1.72) and No.1 (1.68). The smallest (1.41) was noted in Nos.10 and 13, followed by No.4 (1.43). Average and its s.d. through the whole strains were found to be 1.57 ± 0.10.

Minimum : The largest (1.49) was obtained in No.20, which was the same as in cases of the maxima of W, T and W/T, the minimum of W and the range of T, followed by No.1 (1.43) and No.15 (1.40). These combinations of strains were found to be the same as in case of the maximum of W/T. The smallest (1.13) was noted in No.4, followed by No.10 (1.16) and No.11 (1.19). Average and its s.d. through the whole strains were found to be 1.29 ± 0.09.

Range : The largest (0.40) was obtained in No.16, which was the same as in cases of the maximum and the range of L/W, followed by No.8 (0.36) and No.11 (0.35). The combinations of strains were found to be the same as in case of the range of W. The smallest (0.18) was noted in No.13, which was the same as in case of the range of W, followed by Nos.14 and 17 (0.21). Average and its s.d. through the whole strains were found to be 0.29 ± 0.05.

7. Length of husked grains

Maximum : The results are given in Table 5. In this table, the maximum, the minimum and their range are shown. The longest (7.40 mm) was obtained in No.13, which was the same as in cases of the minima of L/W and L/T of the unhusked grains, followed by No.16 (7.30 mm) and No.17 (7.20 mm). The shortest (5.65 mm) was noted in No.10, which was the same as in cases of the maximum and the minimum of W of the unhusked grains, followed by No.6 (5.85 mm) and No.20 (5.90 mm). Average and its s.d. through the whole strains were found to be 6.50 ± 0.54.

Minimum : The longest (6.70 mm) was obtained in No.13, which was the same as in cases of the maximum of L of the husked grains, and the minima of L/W and L/T of the unhusked grains, followed by No.16 (6.50 mm) and No.12 (6.30 mm). The shortest (5.05 mm)was noted in No.10, which was the same as in cases of the maximum and the minimum of W of the unhusked grains, and the maximum of L of the husked grains, followed by No.6 (5.15 mm) and Nos.14 and 20 (5.30 mm). These orders of strains were found to be the same as in case of the maximum of L of the husked grains. Average and its s.d. through the whole strains were found to be 5.78 ± 0.46.

Range : The largest (1.05 mm) was obtained in No.17, which was the same as in cases of the minimum of T and the range of L of the unhusked grains, followed by No.1 (1.00 mm) and No.18 (0.90 mm). The smallest (0.45 mm) was noted in No.11, which was the same as in case of the range of L of the unhusked grains, followed by Nos.2

Table 5. Ranges of the husked grains in the strain level ; length (mm), width (mm), thickness (mm), ratio of length to width (%), ratio of length to thickness (%) and ratio of width to thickness (%)

Strain No.	Length			Width			Thickness			Length/Width			Length/Thickness			Width/Thickness		
	Max.	Min.	Range	Max.	Min.	Range	Max.	Min.	Range	Max.	Min.	Range	Max.	Min.	Range	Max.	Min.	Range
1	7.00	6.00	1.00	2.80	2.50	0.30	2.00	1.70	0.30	2.76	2.32	0.44	3.89	3.16	0.73	1.62	1.32	0.30
2	6.25	5.70	0.55	2.30	2.10	0.20	1.80	1.70	0.10	2.98	2.50	0.48	3.65	3.22	0.43	1.35	1.17	0.18
3	6.15	5.60	0.55	2.70	2.30	0.40	2.05	1.65	0.40	2.57	2.15	0.42	3.52	2.90	0.62	1.64	1.25	0.39
4	6.95	6.20	0.75	2.60	2.10	0.50	2.05	1.70	0.35	3.12	2.60	0.52	3.76	3.17	0.59	1.37	1.10	0.27
5	6.50	5.90	0.60	2.80	2.55	0.25	2.10	1.80	0.30	2.46	2.19	0.27	3.34	2.90	0.44	1.50	1.21	0.29
6	5.85	5.15	0.70	2.25	1.95	0.30	1.85	1.60	0.25	2.85	2.45	0.40	3.44	2.84	0.60	1.30	1.09	0.21
7	6.40	5.65	0.75	2.95	2.65	0.30	2.15	1.90	0.25	2.37	1.92	0.45	3.22	2.65	0.57	1.51	1.23	0.28
8	6.90	6.10	0.80	2.60	2.35	0.25	2.00	1.80	0.20	2.83	2.44	0.39	3.78	3.18	0.60	1.44	1.20	0.24
9	6.10	5.35	0.75	2.75	2.45	0.30	2.15	1.90	0.25	2.42	1.97	0.45	3.13	2.56	0.57	1.44	1.16	0.28
10	5.65	5.05	0.60	2.15	1.85	0.30	1.95	1.70	0.25	2.89	2.46	0.43	3.20	2.67	0.53	1.21	1.05	0.16
11	6.10	5.65	0.45	2.50	2.10	0.40	1.90	1.70	0.20	2.86	2.35	0.51	3.56	3.05	0.51	1.43	1.11	0.32
12	7.10	6.30	0.80	2.80	2.40	0.40	2.10	1.85	0.25	2.77	2.36	0.41	3.76	3.14	0.62	1.47	1.14	0.33
13	7.40	6.70	0.70	2.50	2.30	0.20	2.00	1.80	0.20	3.20	2.76	0.44	3.89	3.45	0.44	1.33	1.15	0.18
14	6.00	5.30	0.70	2.50	2.25	0.25	1.90	1.60	0.30	2.50	2.16	0.34	3.35	2.89	0.46	1.44	1.24	0.20
15	6.00	5.35	0.65	2.10	1.75	0.35	1.60	1.30	0.30	3.20	2.64	0.56	4.06	3.63	0.43	1.50	1.17	0.33
16	7.30	6.50	0.80	2.50	2.20	0.30	1.95	1.65	0.30	3.24	2.70	0.54	4.09	3.51	0.58	1.52	1.18	0.34
17	7.20	6.15	1.05	2.75	2.50	0.25	2.20	1.80	0.40	2.88	2.28	0.60	3.72	2.95	0.77	1.50	1.16	0.34
18	7.10	6.20	0.90	2.95	2.50	0.45	2.20	1.90	0.30	2.80	2.16	0.64	3.68	3.05	0.63	1.49	1.16	0.33
19	6.20	5.50	0.70	3.00	2.60	0.40	2.20	1.80	0.40	2.25	1.93	0.32	3.17	2.64	0.53	1.54	1.18	0.36
20	5.90	5.30	0.60	3.25	2.80	0.45	2.20	1.90	0.30	2.11	1.71	0.40	3.11	2.52	0.59	1.56	1.45	0.11

and 3 (0.55 mm). Average and its s. d. through the whole strains were found to be 0.72 ± 0.15.

8. Width of husked grains

Maximum : The widest (3.25 mm) was obtained in No.20, which was the same as in cases of the maxima of W, T and W/T, the minima of W and W/T, and the range of T of the unhusked grains, followed by No.19 (3.00 mm) and Nos.7 and 18 (2.95 mm). These combinations of strains were found to be the same as in cases of the maximum and the minimum of W of the unhusked grains. The narrowest (2.10 mm) was noted in No.15, followed by No.10 (2.15 mm) and No.6 (2.25 mm). Average and its s.d. through the whole strains were found to be 2.64 ± 0.29.

Minimum : The widest (2.80 mm) was obtained in No.20, which was the same as in cases of the maxima of W, T and W/T, the minima of W and W/T, the range of T of the unhusked grains, and the maximum of W of the husked grains, followed by No.7 (2.65 mm) and No.19 (2.60 mm). These orders of strains were found to be the same as in cases of the maximum and the minimum of W of the unhusked grains. The narrowest (1.75 mm) was noted in No.15, which was the same as in case of the maximum of W of the husked grains, followed by No.10 (1.85 mm) and No.6 (1.95 mm). These orders of strains were found to be the same as in case of the maximum of W of the husked grains. Moreover, these combinations of strains were found to be the same as in cases of the maximum and the minimum of L of the unhusked grains. Average and its s.d. through the whole strains were found to be 2.31 ± 0.27.

Range : The largest (0.50 mm) was obtained in No.4, followed by Nos.18 and 20 (0.45 mm). These combinations of strains were found to be the same as in case of the range of L/T of unhusked grains. The smallest (0.20 mm) was noted in Nos.2 and 13, followed by Nos.5, 8, 14 and 17 (0.25 mm). Average and its s.d. through the whole strains were found to be 0.33 ± 0.08.

9. Thickness of husked grains

Maximum : The thickest (2.20 mm) was obtained in Nos.17, 18, 19 and 20. The thinnest (1.60 mm) was noted in No.15, which was the same as in cases of the maximum and the minimum of W of the husked grains, followed by No.2 (1.80 mm) and No.6 (1.85 mm). Average and its s. d. through the whole strains were found to be 2.02 ± 0.15.

Minimum : The thickest (1.90 mm) was obtained in Nos.7, 9, 18 and 20. The thinnest (1.30 mm) was noted in No.15, which was the same as in cases of the maxima of W and T, and the minimum of W of the husked grains, followed by Nos.6 and 14 (1.60 mm). Average and its s.d. through the whole strains were found to be 1.74 ± 0.14.

Range : The largest (0.40 mm) was obtained in Nos.3, 17 and 19. The smallest (0.10 mm) was noted in No.2, which was the same as in cases of the maximum and the range of T of the unhusked grains, followed by Nos.8, 11 and 13 (0.20 mm). Average and its s.d. through the whole strains were found to be 0.28 ± 0.07.

10. L/W of husked grains

Maximum : The largest (3.24) was obtained in No.16, which was the same as in cases

of the maximum of L/W, the ranges of L/W and W/T of the unhusked grains, followed by Nos.13 and 15 (3.20). The smallest (2.11) was noted in No.20, which was the same as in cases of the maximum and the minimum of L/W of the unhusked grains, followed by No.19 (2.25) and No.7 (2.37). These orders of strains were found to be the same as in case of the maximum of L/W of the unhusked grains. Average and its s.d. through the whole strains were found to be 2.75 ± 0.32.

Minimum : The largest (2.76) was obtained in No.13, which was the same as in cases of the maximum and the minimum of L of the husked grains, the minima of L/W and L/T of the unhusked grains, followed by No.16 (2.70) and No.15 (2.64). These combinations of strains were found to be the same as in case of the maximum of L/W of the husked grains. The smallest (1.71) was noted in No.20, which was the same as in cases of the maximum and the minimum of L/W of the unhusked grains and the maximum of L/W of the husked grains, followed by No.7 (1.92) and No.19 (1.93). These combinations of strains were found to be the same as in cases of the maximum and the minimum of L/W of the unhusked grains, and the maximum of L/W of the husked grains. Average and its s.d. through the whole strains were found to be 2.30 ± 0.27.

Range : The largest (0.64) was obtained in No.18, which was the same as in case of the range of L/T of the unhusked grains, followed by No.17 (0.60) and No.15 (0.56). The smallest (0.27) was noted in No.5, followed by No.19 (0.32) and No.14 (0.34). Average and its s.d. through the whole strains were found to be 0.45 ± 0.09.

11. L/T of husked grains

Maximum : The largest (4.09) was obtained in No.16, which was the same as in cases of the maxima of L/W of the unhusked grains and the husked grains, and the ranges of L/W and W/T of the unhusked grains, followed by No.15 (4.06) and Nos.1 and 13 (3.89). These combinations of strains were found to be the same as in cases of the maximum and the minimum of L/W of the husked grains. The smallest (3.11) was noted in No.20, which was the same as in cases of the maxima and the minima of L/W of the unhusked and the husked grains, followed by No.9 (3.13) and No.19 (3.17). These combinations of strains were found to be the same as in case of the minimum of L/T of the unhusked grains. Average and its s.d. through the whole strains were found to be 3.57 ± 0.30.

Minimum : The largest (3.63) was obtained in No.15, followed by No.16 (3.51) and No.13 (3.45). These combinations of strains were found to be the same as in cases of the maxima of L/W and L/T, and the minimum of L/W of the husked grains. The smallest (2.52) was noted in No.20, which was the same as in cases of the maxima and the minima of L/W of the unhusked and the husked grains, and the maximum of L/T of the husked grains, followed by No.9 (2.56) and No.19 (2.64). These orders of strains were found to be the same as in case of the maximum of L/T of the husked grains. Moreover, these combinations of strains were found to be the same as in cases of the maximum of the husked grains and the minimum of the unhusked grains of L/T. Average and its s.d. through the whole strains were found to be 3.00 ± 0.31.

Range : The largest (0.77) was obtained in No.17, which was the same as in cases of the ranges of L of the unhusked grains, and the minimum of T of the unhusked grains, followed by No.1 (0.73) and No.18 (0.63). These orders of strains were found to be the same as in case of the range of L of the husked grains. The smallest (0.43) was noted in Nos.2 and 15, followed by Nos.5 and 13 (0.44). Average and its s.d. through the whole strains were found to be 0.56 ± 0.09.

12. W/T of husked grains

Maximum : The largest (1.64) was obtained in No.3, followed by No.1 (1.62) and No. 20 (1.56). The smallest (1.21) was noted in No.10, which was the same as in cases of the maximum and the minimum of W of the unhusked grains, and the maximum and the minimum of L of the husked grains, followed by No.6 (1.30) and No.13 (1.33). Average and its s.d. through the whole strains were found to be 1.46 ± 0.10.

Minimum : The largest (1.45) was obtained in No.20, which was the same as in cases of the maxima and the minima of W and W/T, the maximum and the range of T of the unhusked grains, the maximum and the minimum of W of the husked grains, followed by No.1 (1.32) and No.3 (1.25). These combinations of strains were found to be the same as in case of the maximum of W/T of the husked grains. The smallest (1.05) was noted in No.10, which was the same as in cases of the maximum and the minimum of W of the unhusked grains, the maxima of L and W/T and the minimum of L of the husked grains, followed by No.6 (1.09) and No.4 (1.10). Average and its s.d. through the whole strains were found to be 1.19 ± 0.09.

Range : The largest (0.39) was obtained in No.3, which was the same as in case of the maximum of W/T of the husked grains, followed by No.19 (0.36) and Nos.16 and 17 (0.34). These combinaltions of strains were found to be the same as in case of the range of T of the husked grains. The smallest (0.11) was noted in No.20, which was the same as in cases of the maxima and the minima of L/W of the unhusked grains, and of L/W and L/T of the husked grains, followed by No.10 (0.16) and Nos.2 and 13 (0.18). Average and its s.d. through the whole strains were found to be 0.27 ± 0.07.

Discussion

Basing on the results obtained in the present experiment, the following problems are to be discussed here.

1. Rice cultivation in Fiji had been started in Navua areas in late 19th century by Indo-Fijians, who migrated here as contract workers of sugarcane plantation. Cultivation areas was increased from year by year mainly by Indo-Fijians[1,5]. In countries belonging to South Pacific, several trial of rice cultivation had been attempted, most of which were looked upon as unsuccessful, but one in Fiji as successfull[4].

Recently, total estimated rice consumpion was increased from year by year. Government aimed at achievement of self-sufficiency on rice consumption by increasing cultivation area and production per unit area. The followed items are considered

to be counterplan to advance of rice production[2], *i.e.*, irrigation system, increment of cultivation area, selection of adaptive varieties, improvement of soil condition, removal of salt element, protection of insects and diseases, herbicide, trial of manure, renew of seeds, betterment of cultivation techniques, extension services.

For genetic and breeding purposes, however, varietal variations and the methodologies of them should be ascertained as early as possible. Taking these facts into account, the author had made to accomplish the work, the aim of which going to clarify the varietal variation and the phylogenetic relationships of cultivars using the relatively primitive, un-advanced and advanced ones in Fiji.

2. According to the classification noted by Matsuo[3], the strains used here can be divided into two groups ; *i.e.*, type B ---- 7 strains (35% of the whole strains) and type C ---- 13 strains (65% of the whole strains) (showing in left column of Fig. 1). Strains collected by the field survey in East Java[6] were classified into two groups ; *i.e.*, type B ---- 10.3%, type C ---- 89.7%. Constitutions of strains are said to be decided by the areas, from where and at when the respective strains were introduced here.

3. In comparison with the type B and type C in view of type-averages, the following facts were ascertained in cases of the strain-average-values. Averages of type B were smaller than those of type-C in L/W of the unhusked and husked grains and L/T of the husked grains. Averages of type B were larger than those of type C in the remaining 9 characters. In view of s.d., averages of type B were found to be the same as those of type C in W and L/W of the unhusked grains. Averages of type B were larger than those of type C in the remaining 10 characters. It may be noted that the relation was found to be the reversed result in the unhusked and in the husked grains in 1 case, *i. e.*, L/T, and the whole of the s.d., *i.e*, 12 cases, were found to be larger in type B than those of type C.

4. A lot of attempt was made for classifying the cultivated rice strains distributed in all over the world in accordance with the data obtained in grain morphology. Especially, tripartite classification has been adopted in many investigations. However, it was only for the unhusked grains that it was applied. For the husked grains, there is no standard method for the classification. So, it was attempted for the first time in the present experiment (showing in the right part of Fig. 1). Clear tendency was, however, not ascertained here at the present time. As analysis and conclusion have left several points in question, further analyses are to be performed sincerely.

5. In the larger set of strains, the widest of W (3.79 mm in the unhusked grains and 3.07 mm in the husked grains) were obtained in No.20, followed by No.7 (3.40 mm and 2.80 mm in the same order) and No.19 (3.26 mm and 2.75 mm). These orders of strains were finally illustrated as $20 > 7 > 19$, and fixed to be the same as both in the unhusked and the husked grains. These phenomena were found only in this case.

On the other hand, some sets of strains did not show the same orders, but showed the same combinations, which meant the same strain numbers regardless of its orders. For example, in T of the unhusked grains, the thickest (2.31 mm) was obtained in No. 20, followed by Nos.12 and 17 (2.26 mm). These combinations of strains were finally

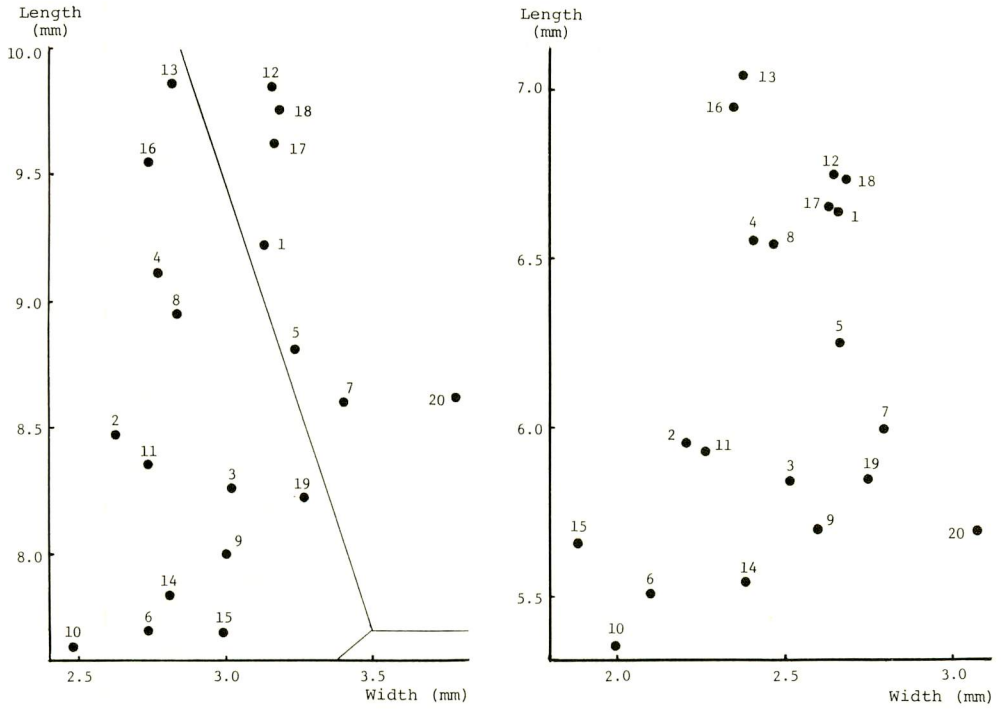

Fig. 1. Relation between length and width of unhusked (left) and husked (right) grains in mm ; vertical axis-length, abscissa-width. Numbers used in the figure are corresponding to the strain number which was used in Table 1.

illustrated as $20 > 12 = 17$. In T of the husked grains, the thickest (2.08 mm) was obtained in No.20, followed by No.17 (2.05 mm) and No.12 (2.04 mm). These combinations of strains were finally illustrated as $20 > 17 > 12$. These combinations of strains were fixed to be the same as both in T of the unhusked and the husked grains, and illustrated as 12 • 17 • 20. These phenomena were found in other 3 cases, *i.e.*, ② 13 • 15 • 16 in the larger sets of L/W ($15 > 13 = 16$) and L/T ($15 > 16 > 13$) in the husked grains ; ③ 7 • 19 • 20 in the smaller sets of L/W of the unhusked ($20 < 7 = 19$) and of the husked ($20 < 19 < 7$) grains ; ④ 9 • 19 • 20 in the smaller sets of L/T of the unhusked ($9 < 19 < 20$) and of the husked ($20 < 9 < 19$) grains. These combinations of ① and ② were constituted only by type B and type C, respectively.

6. In comparison with types B and C in accordance with the tripartite classification, the following facts were ascertained in cases of the ranges. Averages of type B were larger and smaller than those of the type C in 27 and 8 cases, respectively. It was ascertained that the values were quite the same both in type B and type C in the range of T of the unhusked grains. It may be noted that the relations were found to be the reversed results in the unhusked and the husked grains in 4 cases, *i.e.*, the maximum and the minimum of L/T, and the ranges of W and W/T.

7. In the larger set of the maximum of L, the longest (10.50 mm) was obtained in

Nos. 12 and 13, followed by No.18 (10.30 mm). In the larger set of the minimum of L, the longest (9.40 mm) was also obtained in Nos. 12 and 13, followed by No.18 (8.90 mm). These orders of strains were finally illustrated both in the maximum and the minimum of L as 12 = 13 > 18, and were fixed to be the same as in both characters. These phenomena were found in other 6 cases, *i.e.*, ② 20 > 7 > 19 ---- No.20 (3.90 mm, 3.60 mm and 2.80 mm), No. 7 (3.60 mm, 3.20 mm and 2.65 mm) and No. 19 (3.50 mm, 3.10 mm and 2.60 mm) in the larger sets of the maximum and the minimum of the unhusked and the minimum of the husked grains of W ; ③ 17 > 1 > 18 --- No. 17 (1.05 mm and 0.77), No. 1 (1.00 mm and 0.73) and No. 18 (0.90 mm and 0.63) in the larger sets of the ranges of L and L/T of the husked grains ; ④ 10 < 6 < 20 ---- No.10 (5.65 mm and 5.05 mm), No.6 (5.85 mm and 5.15 mm) and No.20 (5.90 mm and 5.30 mm) in the smaller sets of the maximum and the minimum of L of the husked grains ; ⑤ 15 < 10 < 6 ---- No. 15 (2.10 mm and 1.75 mm), No. 10 (2.15 mm and 1.85 mm) and No. 6 (2.25 mm and 1.95 mm) in the smaller sets of the maximum and the minimum of W of the husked grains ; ⑥ 20 < 19 < 7 ---- No.20 (2.50 and 2.11), No.19 (2.65 and 2.25) and No.7 (2.81 and 2.37) in the smaller sets of the maximum of L/W of the unhusked and the husked grains ; ⑦ 20 < 9 < 19 ---- No.20 (3.11 and 2.52), No.9 (3.13 and 2.56) and No.19 (3.17 and 2.64) in the smaller sets of the maximum and the minimum of L/T of the husked grains. These combinations of ③ and ⑤ were constituted by only type B and type C, respectively.

On the other hand, some sets of strains did not show the same orders, but showed the same combinations, which meant the same strain numbers regardless of the orders. Seventeen cases were ascertained, *i.e.*, ① 17 • 18 • 20 in the larger sets ---- the range of L of the unhusked grains (17 > 18 > 20), the maximum of T of the unhusked (20 > 17 = 18), and of the husked (17 = 18 = 20) grains, and the minimum of T of the unhusked grains (17 > 18 = 20) ; ② 7 • 19 • 20 in the larger sets ---- the maximum of W of the unhusked grains, the minimum of W of the unhusked and husked grains (20 > 7 > 19), the maximum of W of the husked grains (20 > 19 > 7), and the maximum of T of the unhusked grains (20 > 7 = 19) ; ③ 8 • 11 • 16 in the larger sets ---- the ranges of W (8 = 11 = 16) and W/T (16 > 8 > 11) of the unhusked grains ; ④ 7 • 18 • 20 in the larger sets ---- the maximum of the unhusked (20 > 7 = 18) and the minimum of the husked (7 = 18 = 20) grains of T ; ⑤ 4 • 13 • 16 in the larger sets ---- the maximum (16 > 13 > 4) and the minimum (13 > 16 > 4) of L/W of the unhusked grains ; ⑥ 4 • 18 • 20 in the larger sets ---- the range of W of the husked grains (4 > 18 = 20) and the range of L/T of the unhusked grains (18 > 4 > 20) ; ⑦ 1 • 15 • 20 in the larger sets ---- the maximum (20 > 15 > 1) and the minimum (20 > 1 > 15) of W/T of the unhusked grains ; ⑧ 13 • 15 • 16 in the larger sets ---- the maxima of L/W (16 > 13 = 15) and L/T (16 > 15 > 13), the minima of L/W (13 > 16 > 15) and L/T (15 > 16 > 13) of the husked grains ; ⑨ 1 • 3 • 20 in the larger sets ---- the maximum (3 > 1 > 20) and the minimum (20 > 1 > 3) of W/T of the husked grains ; ⑩ 3 • 17 • 19 in the larger sets ---- the ranges of T (3 = 17 = 19) and W/T (3 > 19 > 17) of the husked grains ; ⑪ 6 • 10 • 15 in the smaller sets ---- the maximum (6 < 10 =

15) and the minimum (6 = 10 < 15) of the husked grains, and the maximum and the minimum of W of the husked grains (15 < 10 < 6) ; ⑫ 2 · 10 · 13 in the smaller sets ---- the maximum of W (10 < 2 = 13) and the range of T (2 < 10 = 13) of the unhusked grains ; ⑬ 2 • 10 • 11 in the smaller sets ---- the minimum of W (10 < 2 < 11) and the range of T (2 < 10 = 11) of the unhusked grains ; ⑭ 2 • 5 • 13 • 17 in the smaller sets ---- the range of T of the unhusked grains (2 < 5 = 13 = 17) and the range of W of the husked grains (2 = 13 < 5 = 17) ; ⑮ 7 • 19 • 20 in the smaller sets ---- the maxima of the unhusked and the husked grains (20 < 19 < 7), the minima of the unhusked (20 < 7 = 19) and of the husked (20 < 7 < 19) grains of L/W ; ⑯ 9 • 19 • 20 in the smaller sets ---- the maximum and the minimum of the husked grains (20 < 9 < 19), and the minimum of the unhusked grains (9 < 19 < 20) of L/T ; ⑰ 2 • 8 • 13 in the smaller sets ---- the ranges of W (2 = 8 < 13) and T (2 < 8 = 13) of the husked grains. Two (① and ④) and 7 (③, ⑤, ⑧, ⑪, ⑫, ⑬ and ⑰) were constituted only by type B and type C, respectively.

Summary

In 1982, the writer was sent to Fiji as a member of the scientific survey team for a joint work with Kagoshima University and the University of the South Pacific. In this opportunity, 20 strains of *Oryza sativa* L. were collected during the trip. In this paper, some records on morphological characters of the grains and some considerations on ecotypic differentiations have been described, for searching the varietal variations of cultivated rice strains using in Fiji at the present. The results obtained here were summarized as follows :

According to the tripartite classification, they were classified into two groups, *i.e.*, type B ---- 7 strains (35% of the whole strains) and type C ---- 13 strains (65%). Length, width, thickness, L/W, L/T and W/T of the unhusked grains were measured as 8.71 mm, 3.00 mm, 2.12 mm, 2.93, 4.13 and 1.42 in strain averages, respectively. Those of the husked grains were measured in the same order as 6.16 mm, 2.47 mm, 1.90 mm, 2.50, 3. 26 and 1.31 in strain averages, respectively. Nineteen, 3 and 2 characters showed larger, smaller and the same values in type B than those of type C, respectively.

The maximum, the minimum and the pure-range of length, width, thickness, L/W, L/T and W/T in the unhusked grains were ascertained as 9.22 mm, 8.19 mm, 1.03 mm ; 3.19 mm, 2.81 mm, 0.37 mm ; 2.26 mm, 1.96 mm, 0.30 mm ; 3.22, 2.67, 0.54 ; 4.48, 3.80, 0.67 ; 1.57, 1.29, 0.29 in average values, respectively. Those in the husked grains in the same order were ascertained as 6.50 mm, 5.78 mm, 0.72 mm ; 2.64 mm, 2.31 mm, 0.33 mm ; 2.02 mm, 1.74 mm, 0.28 mm ; 2.75, 2.30, 0.45 ; 3.57, 3.00, 0.56 ; 1.46, 1.19, 0.27 in average values, respectively. Twenty seven, 8 and 1 characters showed larger, smaller and the same values in type B than those of type C, respectively.

Basing on the data obtained in those characters, several patterns were found to be strain specificities. Strains showing relatively large or small values in the respective

characters were picked up and grouped as "order" and "combination".

References

1) Annual Report for the year 1979, 1981 : Parliamentary Report No.14 of 1981. Ministry of Agriculture and Fisheries, Fiji.
2) Annual Research Report 1981 : Department of Agriculture, Fiji.
3) Matsuo, T. 1952 : Genecological studies on the cultivated rice (in Japanese with English Summary). Bull. Inst. Agr. Sci. Series **D, 3,** 1-111.
4) Katayama, T. C. 1983 : Some aspect on rice cultivation in Fiji and Solomon Islands. Prompt Rep. 2nd Sci. Survey South Pacific, 39-41.
5) Katayama, T. C. 1983 : Agricultural policy in Fiji (in Japanese). KCIE Occasional Paper, **9**, 1-23.
6) Katayama, T. C. 1983 : Some aspects on rice cultivation in East Java, Indonesia, especially on Madura Island. Mem. Kagoshima Univ. Res. Center S. Pacific, **3,** 99-115.