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Morphological Characters of the Cultivated Rice Grains of Burma (II)

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Introduction

During the period from December in 1978 to February in 1979, four scientists including the present author were sent to India and Burma for collection of the wild and cultivated rice under the project, designated "The Distribution of Wild Rice and the Ecotypic Differentiation of Cultivated Rice in Burma and Assam", supported by a Grant from the Ministry of Education, Japan. In this opportunity, 64 strains of cultivated rice distributed in the large areas of Burma, were collected by the members of the party. The grains of these strains were used for the morphological studies.

Generally accepted indigenous centre of rice is an area embracing south Asia, southeast Asia and China. Morinaga[5] stated that spacial gene-pattern of ecospecies "*japonica*" is probably to be established around southeast Himalaya. East and northeastern parts of India have been considered to be one of the differentiation centres of rice in accordance with many investigations. Sharma *et al.*[6] carried out some systematic collection of the current and the primitive cultivars of rice in the northeastern parts of India.

Burma is located in the adjacent regions mentioned above, and having long history of rice cultivation. All over the land of Burma, rice varieties showed very large varietal variations[7]. However, any accumulation of complete data endorsed by discussions on these aspects has been unfortunately far from being perfect. The present experimental series has been made to search the varietal variations, taking these facts into considerations. In the previous paper[2], the record of morphological characters of the unhusked and the husked grains and some mutual relations were reported.

In the present paper, comparison of the unhusked and husked grains for 12 characters and variation ranges in 12 characters were mainly described, in order to confirm the morphological characters of grains contributable for making the strain's specificities clear. Variation ranges were used in wild species of *Vigna* sp. for the first time by the present author in this field, and some useful informations were obtained[1]. So, these characters were applied to the cultivated rice strains here.

Materials and Methods

Sixty-four strains of rice cultivars, *Oryza sativa* L., collected in Burma were used in this experiment. They are listed up in Table 1 of the previous paper[2]. In this table, collection number, collection date, collection place, and some detailed informations were mentioned.

Thirty grains were used for the measurement of each strain. Comparative values for 6 characters (Table 1) were illustrated by the ratios of value fixed in the husked to the value fixed in

the unhusked grains in the respective characters. The following 6 characters of the unhusked and the husked grains (Table 2) were illustrated by the area (=length×width) and volume (=length×width×thickness) for unhusked and the husked grains, the area and volume quotients (=ratio of value of husked to value of unhusked grains). The whole data referring to the 12 characters were illustrated by the average value through the whole grains.

The variation ranges in 12 characters (Tables 3 and 4) were illustrated by the maximum, the minimum and pure-range value in the whole grains.

In the present experiment, the following abbreviations were used, *i.e.*, 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), UHG (unhusked grain), HG (husked grain).

Results

PART I. The respective characters

1. Quotients in L

The results are given in Table 1. The values for the individual grain level ranged from 0.78 (strain No. 40) to 0.63 (Nos. 11 and 28). In the strain level, the largest (0.74) was obtained in No. 29, followed by Nos. 31 and 57 (0.73). The smallest (0.66) was noted in No. 11, followed by Nos. 4, 10, 15, 27, 53 and 54 (0.69). Average and its s.d. through the whole strains were found to be 0.71 ± 0.01. The s.d. of each strain, *i.e.*, the ones showing intra-population's variations, obtained were found to be 0.01 ± 0.01.

Table 1. Comparative table showing some morphological characters of the unhusked and the husked grains; illustrated by the ratios of value in husked to value in unhusked grains in the respective characters

Strain No.	Length	Width	Thickness	L/W	L/T	W/T
1	0.71±0.01	0.84±0.02	0.91±0.02	0.84±0.02	0.78±0.02	0.93±0.03
2	0.72±0.01	0.88±0.03	0.91±0.01	0.82±0.04	0.80±0.01	0.98±0.03
3	0.70±0.01	0.84±0.02	0.90±0.02	0.83±0.03	0.78±0.03	0.93±0.04
4	0.69±0.02	0.82±0.02	0.91±0.02	0.84±0.03	0.76±0.03	0.90±0.04
5	0.71±0.02	0.83±0.02	0.91±0.01	0.86±0.03	0.79±0.02	0.92±0.03
6	0.71±0.01	0.86±0.03	0.91±0.01	0.83±0.04	0.79±0.02	0.95±0.03
7	0.70±0.02	0.78±0.03	0.91±0.01	0.90±0.03	0.78±0.02	0.86±0.03
8	0.70±0.01	0.84±0.04	0.90±0.01	0.83±0.05	0.78±0.02	0.93±0.05
9	0.71±0.02	0.84±0.02	0.90±0.02	0.85±0.04	0.78±0.03	0.93±0.03
10	0.69±0.02	0.84±0.03	0.91±0.01	0.82±0.04	0.75±0.03	0.92±0.03
11	0.66±0.01	0.83±0.02	0.90±0.02	0.80±0.02	0.74±0.02	0.93±0.02
12	0.71±0.01	0.84±0.02	0.91±0.01	0.85±0.03	0.77±0.02	0.91±0.03
13	0.70±0.01	0.85±0.02	0.91±0.01	0.83±0.02	0.77±0.02	0.94±0.02
14	0.72±0.02	0.83±0.02	0.91±0.01	0.87±0.02	0.79±0.02	0.92±0.02
15	0.69±0.01	0.80±0.03	0.91±0.02	0.86±0.03	0.76±0.02	0.89±0.03
16	0.70±0.01	0.80±0.01	0.90±0.01	0.87±0.02	0.77±0.02	0.89±0.02
17	0.70±0.01	0.84±0.02	0.91±0.01	0.84±0.02	0.78±0.02	0.92±0.03
18	0.71±0.01	0.85±0.02	0.91±0.01	0.84±0.02	0.79±0.02	0.94±0.03
19	0.72±0.01	0.85±0.02	0.91±0.01	0.85±0.02	0.79±0.01	0.94±0.02

Table 1. (Continued)

Strain No.	Length	Width	Thickness	L/W	L/T	W/T
20	0.71±0.02	0.87±0.01	0.91±0.01	0.82±0.02	0.78±0.03	0.96±0.01
21	0.70±0.01	0.86±0.02	0.91±0.01	0.81±0.02	0.78±0.01	0.96±0.02
22	0.71±0.02	0.82±0.02	0.90±0.01	0.87±0.03	0.79±0.02	0.91±0.04
23	0.71±0.02	0.87±0.01	0.91±0.01	0.82±0.02	0.78±0.02	0.95±0.02
24	0.71±0.01	0.84±0.02	0.91±0.01	0.85±0.02	0.79±0.01	0.93±0.03
25	0.71±0.01	0.85±0.02	0.91±0.01	0.84±0.03	0.79±0.02	0.94±0.02
26	0.70±0.01	0.84±0.02	0.91±0.01	0.83±0.02	0.77±0.01	0.93±0.02
27	0.69±0.01	0.82±0.01	0.91±0.01	0.84±0.02	0.76±0.01	0.91±0.02
28	0.70±0.02	0.81±0.02	0.91±0.01	0.86±0.03	0.77±0.02	0.89±0.02
29	0.74±0.01	0.85±0.02	0.91±0.01	0.87±0.02	0.82±0.02	0.94±0.02
30	0.71±0.01	0.83±0.01	0.91±0.01	0.85±0.02	0.79±0.01	0.92±0.01
31	0.73±0.01	0.84±0.02	0.90±0.02	0.87±0.02	0.82±0.02	0.94±0.03
32	0.71±0.01	0.90±0.02	0.89±0.03	0.79±0.02	0.79±0.03	1.01±0.03
33	0.72±0.01	0.88±0.02	0.91±0.01	0.82±0.03	0.79±0.02	0.97±0.03
34	0.71±0.02	0.87±0.03	0.90±0.01	0.82±0.03	0.79±0.02	0.97±0.03
35	0.70±0.01	0.84±0.01	0.91±0.01	0.83±0.01	0.77±0.02	0.93±0.01
36	0.71±0.01	0.89±0.02	0.91±0.01	0.80±0.02	0.78±0.02	0.97±0.04
37	0.72±0.01	0.87±0.02	0.91±0.01	0.83±0.02	0.79±0.02	0.95±0.02
38	0.72±0.01	0.88±0.02	0.92±0.01	0.81±0.02	0.78±0.02	0.96±0.02
39	0.71±0.01	0.88±0.01	0.92±0.01	0.82±0.02	0.78±0.02	0.96±0.02
40	0.72±0.02	0.86±0.01	0.92±0.01	0.84±0.02	0.78±0.02	0.94±0.02
41	0.71±0.01	0.87±0.01	0.91±0.01	0.81±0.02	0.77±0.02	0.96±0.02
42	0.72±0.01	0.90±0.01	0.91±0.01	0.80±0.02	0.79±0.01	0.98±0.01
43	0.70±0.01	0.87±0.01	0.91±0.01	0.81±0.02	0.77±0.01	0.95±0.02
44	0.71±0.02	0.91±0.02	0.90±0.01	0.79±0.03	0.79±0.02	1.00±0.02
45	0.71±0.01	0.88±0.03	0.91±0.01	0.82±0.03	0.79±0.02	0.96±0.03
46	0.71±0.02	0.91±0.01	0.91±0.01	0.78±0.02	0.78±0.03	1.00±0.01
47	0.71±0.01	0.87±0.03	0.91±0.01	0.82±0.03	0.78±0.02	0.95±0.03
48	0.70±0.01	0.87±0.02	0.92±0.01	0.81±0.03	0.76±0.02	0.95±0.03
49	0.72±0.01	0.90±0.01	0.91±0.00	0.80±0.02	0.78±0.01	0.99±0.01
50	0.71±0.02	0.88±0.02	0.91±0.00	0.81±0.03	0.78±0.02	0.96±0.02
51	0.71±0.01	0.86±0.01	0.90±0.01	0.83±0.01	0.79±0.02	0.95±0.01
52	0.71±0.01	0.91±0.01	0.91±0.01	0.78±0.01	0.78±0.01	1.00±0.01
53	0.69±0.02	0.88±0.02	0.90±0.01	0.78±0.03	0.77±0.02	0.98±0.02
54	0.69±0.01	0.89±0.02	0.90±0.01	0.77±0.02	0.76±0.01	1.00±0.02
55	0.72±0.02	0.88±0.02	0.90±0.01	0.82±0.03	0.80±0.02	0.99±0.02
56	0.70±0.02	0.86±0.01	0.90±0.02	0.81±0.02	0.78±0.03	0.96±0.02
57	0.73±0.01	0.85±0.02	0.90±0.01	0.87±0.02	0.81±0.02	0.94±0.02
58	0.71±0.01	0.85±0.01	0.90±0.01	0.84±0.02	0.79±0.02	0.94±0.01
59	0.72±0.01	0.87±0.01	0.91±0.01	0.83±0.02	0.79±0.02	0.96±0.02
60	0.70±0.02	0.84±0.01	0.91±0.01	0.83±0.02	0.77±0.02	0.93±0.02
61	0.71±0.01	0.83±0.01	0.91±0.01	0.86±0.01	0.78±0.02	0.91±0.01
62	0.70±0.01	0.88±0.02	0.88±0.01	0.79±0.02	0.79±0.01	1.00±0.02
63	0.71±0.01	0.87±0.03	0.91±0.01	0.82±0.03	0.77±0.02	0.95±0.03
64	0.71±0.01	0.91±0.01	0.91±0.00	0.79±0.02	0.78±0.01	0.99±0.01

2. Quotients in W

The values for the individual grain level ranged from 0.95 (No. 45) to 0.74 (Nos. 7 and 15). In the strain level, the largest (0.91) was obtained in Nos. 44, 46, 52 and 64. The smallest (0.78) was noted in No. 7, followed by Nos. 15 and 16 (0.80). Average and its s.d. through the whole strains were found to be 0.86 ± 0.03. S.d. of each strain were found to be 0.02 ± 0.01.

3. Ouotients in T

The values for the individual grain level ranged from 0.96 (No. 1) to 0.84 (No. 32). In the strain level, the largest (0.92) was obtained in Nos. 38, 39, 40 and 48. The smallest (0.88) was noted in No. 62, followed by No. 32 (0.89). Average and its s.d. through the whole strains were found to be 0.91 ± 0.01. S.d. of each strain were found to be 0.01 ± 0.01.

4. Quotients in L/W

The values for the individual grain level ranged from 0.97 (No. 7) to 0.72 (No. 53). In the strain level, the largest (0.90) was obtained in No. 7, followed by Nos. 14, 16, 22, 29, 31 and 57 (0.87). The smallest (0.77) was noted in No. 54, followed by Nos. 46, 52 and 53 (0.78). Average and its s.d. through the whole strains were found to be 0.83 ± 0.03. S.d. of each strain were found to be 0.02 ± 0.01.

5. Quotients in L/T

The values for the individual grain level ranged from 0.88 (No. 56) to 0.66 (No. 10). In the strain level, the largest (0.82) was obtained in Nos. 29 and 31, followed by No. 57 (0.81). These combinations of strains were found to be the same as in case of L. The smallest (0.74) was noted in No. 11, which was the same as in case of L, followed by No. 10 (0.75) and Nos. 4, 15, 27, 48 and 54 (0.76). These combinations of strains were also found to be the same as in case of L. Average and its s.d. through the whole strains were found to be 0.78 ± 0.01. S.d. of each strain were found to be 0.02 ± 0.01.

6. Quotients in W/T

The values for the individual grain level ranged from 1.07 (No. 32) to 0.82 (No. 7). In the strain level, the largest (1.01) was obtained in No. 32, followed by Nos. 44, 46, 52, 54 and 62 (1.00). The smallest (0.86) was noted in No. 7, which was the same as in case of W, followed by Nos. 15, 16 and 28 (0.89). These orders of strains were found to be the same as in case of W. Average and its s.d. through the whole strains were found to be 0.95 ± 0.03. S.d. of each strain were found to be 0.02 ± 0.01.

7. Areas in UHG

The results are given in Table 2. The practical values for the individual grain level ranged from 37.43 mm^2 (No. 31) to 15.62 mm^2 (No. 9). In the strain level, the widest (33.20 mm^2) was obtained in No. 31, followed by the No. 28 (31.97 mm^2) and No. 15 (31.75 mm^2). The narrowest (18.40 mm^2) was noted in No. 62, which was the same as in case of T, followed by No. 9 (19.87 mm^2) and No. 54 (21.06 mm^2). Average and its s.d. through the whole strains were found to be 26.45 ± 2.68.

The largest of s.d. (3.29) was obtained in No. 9, followed by No. 4 (2.57) and No. 8 (2.49). It was noted that the value was particularly large in No. 9. The smallest of s.d. (0.92) was noted in No. 43, followed by No. 14 (1.11) and No. 62 (1.15). It was also noted that the value was

Table 2. Six characters of the unhusked and the husked grains; illustrated by the area (=length ×width), the volume (=length×width×thickness), the area and volume quotients (= ratio of value of husked to value of unhusked grains)

Strain No.	Unhusked		Husked		Quotient	
	Area (mm^2)	Volume (mm^3)	Area (mm^2)	Volume (mm^3)	Area	Volume
1	28.32±1.81	63.85±5.05	16.90±1.02	34.72±2.62	0.60±0.02	0.55±0.02
2	25.27±1.37	53.94±5.16	16.18±1.20	31.40±3.83	0.64±0.03	0.58±0.03
3	24.85±1.96	52.79±6.13	14.53±1.06	27.77±3.04	0.59±0.02	0.53±0.02
4	23.07±2.57	48.09±7.37	13.02±1.66	24.63±4.29	0.56±0.02	0.51±0.02
5	27.27±1.93	57.42±5.77	16.08±1.22	30.56±3.23	0.59±0.02	0.53±0.02
6	28.03±2.20	62.32±6.65	17.02±1.23	34.32±3.48	0.61±0.02	0.55±0.02
7	29.21±2.00	64.50±6.40	15.97±1.25	32.03±3.35	0.55±0.02	0.50±0.02
8	23.67±2.49	49.00±9.45	13.92±1.64	26.03±5.55	0.59±0.03	0.53±0.03
9	19.87±3.29	37.99±9.19	11.67±1.89	20.12±5.01	0.59±0.02	0.53±0.02
10	26.31±2.45	57.14±7.35	15.17±1.41	29.87±3.88	0.58±0.02	0.52±0.02
11	25.26±1.87	49.31±5.14	13.72±0.95	23.94±2.48	0.54±0.02	0.49±0.02
12	27.69±1.68	63.71±4.82	16.26±0.76	34.10±2.27	0.59±0.02	0.54±0.02
13	26.57±1.75	59.03±4.94	15.80±1.24	31.91±3.04	0.60±0.01	0.54±0.01
14	27.76±1.11	58.24±3.47	16.43±1.08	31.19±2.71	0.59±0.03	0.54±0.02
15	31.75±1.84	71.43±4.51	17.50±0.89	35.78±2.66	0.55±0.02	0.50±0.03
16	27.78±2.32	59.61±6.67	15.50±1.18	30.04±3.17	0.56±0.02	0.51±0.01
17	28.37±1.96	60.48±5.51	16.67±1.08	32.23±2.96	0.59±0.02	0.53±0.02
18	24.04±1.25	52.29±2.57	14.55±0.74	28.68±1.51	0.61±0.02	0.55±0.02
19	25.97±1.23	56.92±3.51	15.72±0.63	31.25±2.05	0.61±0.02	0.55±0.02
20	29.32±2.02	68.23±6.17	17.96±1.33	38.05±3.57	0.61±0.02	0.56±0.02
21	29.13±1.97	64.34±6.21	17.58±1.27	35.13±3.51	0.61±0.01	0.55±0.01
22	27.65±2.06	57.44±5.41	15.92±1.31	29.77±3.14	0.58±0.02	0.52±0.02
23	24.34±1.44	58.57±4.66	14.84±0.87	32.44±2.75	0.61±0.01	0.55±0.01
24	26.82±1.29	58.36±4.01	16.03±0.79	31.57±2.32	0.60±0.02	0.54±0.01
25	23.32±1.79	48.63±4.33	14.06±1.09	26.52±2.42	0.60±0.02	0.55±0.02
26	28.39±1.92	64.08±5.69	16.82±1.21	34.51±3.30	0.59±0.02	0.54±0.02
27	27.52±1.62	58.22±4.03	15.50±0.79	29.70±1.76	0.56±0.01	0.51±0.01
28	31.97±1.98	70.74±6.00	18.13±1.28	36.51±3.36	0.57±0.01	0.52±0.02
29	27.25±1.87	58.91±5.09	17.30±0.97	33.92±2.62	0.64±0.02	0.58±0.02
30	26.39±1.70	57.40±4.20	15.55±1.10	30.69±2.53	0.59±0.01	0.54±0.02
31	33.20±1.75	76.44±4.62	20.46±1.08	42.21±2.77	0.62±0.02	0.55±0.02
32	26.32±1.18	63.33±4.11	16.72±0.95	35.87±2.93	0.64±0.02	0.57±0.03
33	29.18±1.68	70.88±5.71	18.49±1.24	40.80±3.60	0.63±0.02	0.58±0.02
34	23.43±1.72	49.79±4.77	14.50±1.03	27.76±2.65	0.62±0.03	0.56±0.03
35	27.01±1.32	62.04±4.14	15.93±0.85	33.28±2.46	0.59±0.01	0.54±0.01
36	31.70±1.99	77.61±5.16	19.89±1.23	44.52±3.01	0.63±0.02	0.57±0.02
37	27.02±1.75	64.29±5.10	16.80±0.94	36.50±2.60	0.62±0.02	0.57±0.02
38	26.60±1.57	63.21±4.10	16.83±0.94	36.69±2.42	0.64±0.01	0.58±0.01
39	27.52±1.35	67.13±3.84	17.19±0.89	38.37±2.41	0.63±0.01	0.57±0.02
40	27.92±1.17	68.68±3.87	17.18±0.74	38.62±2.36	0.62±0.02	0.56±0.02
41	26.75±1.33	63.32±3.96	16.49±0.82	35.63±2.33	0.62±0.01	0.56±0.01
42	26.39±1.18	60.86±3.84	16.99±0.64	35.80±2.25	0.65±0.01	0.59±0.02

Table 2. (Continued)

Strain No.	Unhusked		Husked		Quotient	
	Area (mm^2)	Volume (mm^3)	Area (mm^2)	Volume (mm^3)	Area	Volume
43	26.19±0.92	61.25±2.96	15.97±0.61	34.07±1.85	0.61±0.01	0.56±0.01
44	21.27±1.30	42.93±3.42	13.62±0.77	24.79±1.94	0.64±0.02	0.58±0.02
45	27.78±1.37	62.88±3.31	17.32±0.57	35.71±2.23	0.63±0.02	0.57±0.03
46	27.00±1.33	61.73±3.55	17.54±0.84	36.61±2.13	0.65±0.02	0.59±0.01
47	25.26±1.49	59.17±3.79	15.59±1.20	33.30±2.68	0.62±0.02	0.56±0.02
48	27.74±1.48	68.96±4.56	16.84±0.87	38.39±2.42	0.61±0.02	0.56±0.02
49	26.53±1.18	60.27±3.24	17.11±0.77	35.43±2.01	0.65±0.01	0.59±0.01
50	24.49±1.65	55.47±4.71	15.24±0.96	31.47±2.63	0.62±0.02	0.59±0.02
51	25.62±1.32	54.63±3.55	15.53±0.79	29.86±2.16	0.61±0.01	0.55±0.01
52	24.85±1.17	56.21±3.45	16.05±0.70	33.05±1.99	0.65±0.02	0.59±0.01
53	22.26±1.42	45.25±4.08	13.25±0.86	24.71±2.45	0.61±0.02	0.55±0.02
54	21.06±1.52	40.81±4.10	12.90±0.78	22.48±2.06	0.61±0.01	0.55±0.01
55	25.17±1.58	49.39±5.54	16.01±0.95	28.75±1.97	0.64±0.02	0.57±0.02
56	27.52±1.34	54.74±3.62	16.53±0.77	29.43±1.89	0.60±0.02	0.54±0.02
57	27.65±1.86	56.79±4.50	17.20±1.04	31.79±2.27	0.62±0.02	0.56±0.02
58	26.86±1.23	55.07±3.85	15.96±0.72	29.43±2.11	0.60±0.01	0.54±0.01
59	28.31±1.35	60.28±3.43	17.55±0.67	33.88±2.10	0.62±0.02	0.56±0.02
60	27.22±1.61	58.05±5.42	16.02±1.18	31.00±3.44	0.59±0.02	0.53±0.02
61	24.36±1.74	55.64±4.83	14.22±0.87	29.59±2.24	0.59±0.01	0.53±0.01
62	18.40±1.15	32.32±2.08	11.27±0.58	17.40±1.31	0.61±0.02	0.54±0.02
63	25.09±1.66	56.91±4.79	15.33±1.02	31.75±2.76	0.61±0.02	0.56±0.02
64	26.22±1.79	59.47±4.48	16.87±1.12	34.89±2.74	0.64±0.02	0.59±0.02

particularly small in No. 43. S.d. of each strain were found to be 1.66±0.42.

8. Volumes in UHG

The practical values for the individual grain level ranged from 85.96 mm^3 (No. 31) to 28.12 mm^3 (No. 9). In the strain level, the largest (77.61 mm^3) was obtained in No. 36, followed by No. 31 (76.44 mm^3) and No. 15 (71.43 mm^3). The smallest (32.32 mm^3) was noted in No. 62, which was the same as in cases of T and area of UHG, followed by No. 9 (37.99 mm^3) and No. 54 (40.81 mm^3). These orders of strains were found to be the same as in case of area (UHG). It was noted that the value was particularly small in No. 62. Average and its s.d. through the whole strains were found to be 58.46±8.28.

The largest of s.d. (9.45) was obtained in No. 8, followed by No. 9 (9.19) and No. 4 (7.37). These combinations of strains were found to be the same as in case of area of UHG. The smallest of s.d. (2.08) was noted in No. 62, followed by No. 18 (2.57) and No. 43 (2.96). S.d. of each strain were found to be 4.78±1.38.

9. Areas of HG

The practical values for the individual grain level ranged from 23.27 mm^2 (No. 31) to 9.62 mm^2 (No. 9). In the strain level, the widest (20.46 mm^2) was obtained in No. 31, which was the same as in case of area (UHG), followed by No. 36 (19.89 mm^2) and No. 33 (18.49 mm^2). The narrowest

(11.27 mm^2) was noted in No. 62, which was the same as in cases of T, area and volume (UHG), followed by No. 9 (11.67 mm^2) and No. 54 (12.90 mm^2). These orders of strains were found to be the same as in cases of area and volume (UHG). Average and its s.d. through the whole strains were found to be 16.00 ± 1.67.

The largest of s.d. (1.89) was obtained in No. 9, which was the same as in case of area (UHG), followed by No. 4 (1.66) and No. 8 (1.64). These combinations of strains were found to be the same as in cases of area and volume (UHG). Moreover, these orders of strains were found to be the same as in case of area (UHG). The smallest of s.d. (0.57) was noted in No. 45, followed by No. 62 (0.58) and No. 43 (0.61). S.d. of each strain were found to be 1.00 ± 0.27.

10. Volumes in HG

The practical values for the individual grain level ranged from 49.44 mm^3 (No. 36) to 15.06 mm^3 (No. 62). In the strain level, the largest (44.52 mm^3) was obtained in No. 36, which was the same as in case of volume (UHG), followed by No. 31 (42.21 mm^3) and No. 33 (40.80 mm^3). These combinations of strains were found to be the same as in case of area (HG). The smallest (17.40 mm^3) was noted in No. 62, which was the same as in cases of T, areas (UHG and HG) and volume (UHG), followed by No. 9 (20.12 mm^3) and No. 54 (22.48 mm^3). These orders of strains were found to be the same as in cases of areas (UHG and HG) and volume (UHG). Average and its s.d. through the whole strains were found to be 32.08 ± 4.99.

The largest of s.d. (5.55) was obtained in No. 8, which was the same as in case of volume (UHG), followed by No. 9 (5.01) and No. 4 (4.29). These combinations of strains were found to be the same as in cases of areas (UHG and HG) and volume (UHG). Moreover, these orders of strains were found to be the same as in case of volume (UHG). The smallest of s.d. (1.31) was noted in No. 62, which was the same as in case of volume (UHG), followed by No. 18 (1.51) and No. 27 (1.76). S.d. of each strain were found to be 2.71 ± 0.76.

11. Quotients in areas

The values for the individual grain level ranged from 0.68 (Nos. 46, 50 and 52) to 0.50 (Nos. 11 and 15). In the strain level, the largest (0.65) was obtained in Nos. 42, 46, 49 and 52. The smallest (0.54) was noted in No. 11, which was the same as in cases of L and L/T, followed by Nos. 7 and 15 (0.55). Average and its s.d. through the whole strains were found to be 0.61 ± 0.03. S.d. of each strain were found to be 0.02 ± 0.01.

12. Quotients in volumes

The values for the individual grain level ranged from 0.63 (No. 20) to 0.41 (No. 15). In the strain level, the largest (0.59) was obtained in Nos. 42, 46, 49, 50, 52 and 62. These combinations of strains were found to be nearly the same as in case of quotient of areas. The smallest (0.49) was noted in No. 11, which was the same as in cases of L, L/T and quotient of areas, followed by Nos. 7 and 15 (0.50). These orders of strains were found to be the same as in case of quotient of areas. Average and its s.d. through the whole strains were found to be 0.55 ± 0.02. S.d. of each strain were found to be 0.02 ± 0.11.

PART II. Ranges in the respective characters

1. Lengths in UHG

Maximum: The results are given in Table 3. In this table, the maximum, the minimum and

Table 3. 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	9.85	8.15	1.60	3.45	2.90	0.55	2.50	2.15	0.35	2.99	2.50	0.49	4.23	3.67	0.56	1.57	1.20	0.37
2	8.15	7.10	1.05	3.50	3.00	0.50	2.30	1.65	0.65	2.53	2.13	0.40	4.67	3.17	1.50	1.85	1.39	0.46
3	9.25	8.10	1.15	3.25	2.50	0.75	2.35	1.90	0.45	3.36	2.60	0.76	4.53	3.60	0.93	1.46	1.21	0.25
4	9.50	7.35	2.15	3.25	2.30	0.95	2.35	1.85	0.50	3.61	2.54	1.07	4.33	3.57	0.76	1.52	1.15	0.37
5	10.40	8.55	1.85	3.20	2.40	0.80	2.30	1.90	0.40	3.77	2.67	1.10	5.00	3.72	1.28	1.47	1.23	0.24
6	9.40	8.25	1.15	3.55	2.80	0.75	2.40	2.05	0.35	3.13	2.38	0.75	4.45	3.55	0.90	1.59	1.27	0.32
7	10.75	8.80	1.95	3.40	2.70	0.70	2.55	2.00	0.55	3.62	2.74	0.88	4.78	3.79	0.99	1.50	1.27	0.23
8	9.00	7.35	1.65	3.40	2.40	1.00	2.45	1.75	0.70	3.42	2.33	1.09	4.97	3.29	0.68	1.63	1.25	0.38
9	9.00	7.10	1.90	3.25	2.10	1.15	2.25	1.70	0.55	3.71	2.69	1.02	4.74	3.64	1.10	1.46	1.13	0.33
10	9.55	8.30	1.25	3.50	2.60	0.90	2.30	1.85	0.45	3.38	2.60	0.78	4.68	3.86	0.82	1.52	1.21	0.31
11	10.50	9.05	1.45	2.80	2.40	0.40	2.20	1.75	0.45	4.12	3.57	0.55	5.65	4.48	1.17	1.51	1.23	0.28
12	9.25	8.05	1.20	3.50	2.90	0.60	2.40	2.05	0.35	3.03	2.49	0.54	4.44	3.50	0.94	1.54	1.25	0.29
13	8.90	7.70	1.20	3.50	2.90	0.60	2.40	2.05	0.35	2.79	2.37	0.42	4.05	3.38	0.67	1.55	1.25	0.30
14	10.75	9.40	1.35	2.90	2.60	0.30	2.20	1.95	0.25	4.06	3.40	0.66	5.18	4.48	0.70	1.42	1.21	0.21
15	10.20	9.05	1.15	3.55	2.80	0.75	2.65	2.05	0.60	3.41	2.59	0.82	4.66	3.60	1.06	1.66	1.06	0.60
16	10.40	8.85	1.55	3.40	2.60	0.80	2.30	1.90	0.40	3.83	2.89	0.94	5.20	4.09	1.11	1.51	1.22	0.29
17	10.80	8.85	1.95	3.30	2.70	0.60	2.30	1.90	0.40	3.83	2.74	1.09	5.07	4.02	1.05	1.58	1.23	0.35
18	8.60	7.75	0.85	3.20	2.70	0.50	2.35	2.05	0.30	3.17	2.59	0.58	4.10	3.44	0.66	1.56	1.17	0.39
19	8.45	7.70	0.75	3.40	3.00	0.40	2.40	2.00	0.40	2.68	2.35	0.33	4.23	3.35	0.88	1.70	1.30	0.40
20	10.10	8.75	1.35	3.30	2.80	0.50	2.45	2.00	0.45	3.28	2.90	0.38	4.51	3.83	0.68	1.50	1.22	0.28
21	10.05	8.55	1.50	3.45	2.80	0.65	2.35	2.00	0.35	3.39	2.71	0.68	4.50	3.96	0.54	1.55	1.27	0.28
22	10.65	8.95	1.70	3.05	2.50	0.55	2.20	1.90	0.30	3.82	3.26	0.56	5.21	4.26	0.95	1.47	1.23	0.24
23	8.80	6.50	2.30	3.45	2.00	1.45	2.60	2.00	0.60	2.79	1.91	0.88	4.19	2.75	1.44	1.60	1.20	0.40
24	9.30	8.05	1.25	3.20	2.90	0.30	2.35	2.05	0.30	3.10	2.60	0.50	4.34	3.73	0.61	1.52	1.30	0.22
25	9.30	7.95	1.35	3.15	2.40	0.75	2.25	1.95	0.30	3.81	2.64	1.17	4.68	3.69	0.99	1.54	1.16	0.38
26	9.10	8.00	1.10	3.70	2.90	0.80	2.40	2.10	0.30	3.00	2.35	0.65	4.14	3.46	0.68	1.63	1.32	0.31
27	10.80	9.20	1.60	3.00	2.60	0.40	2.25	2.00	0.25	3.81	3.24	0.57	5.18	4.18	1.00	1.43	1.21	0.22
28	10.80	9.55	0.85	3.35	2.75	0.60	2.35	2.05	0.30	3.91	3.14	0.77	5.12	4.32	0.80	1.51	1.22	0.29
29	10.05	9.00	1.05	3.25	2.70	0.55	2.25	2.10	0.15	3.57	3.03	0.54	4.71	4.04	0.67	1.46	1.20	0.26
30	9.20	8.10	1.10	3.40	2.80	0.60	2.40	2.00	0.40	3.07	2.40	0.67	4.35	3.40	0.95	1.53	1.27	0.26
31	10.10	8.65	1.45	3.85	3.10	0.75	2.50	2.15	0.35	3.02	2.39	0.63	4.58	3.60	0.98	1.68	1.29	0.39

Table 3. (Continued)

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
32	8.25	7.30	0.95	3.55	3.15	0.40	2.55	2.25	0.30	2.52	2.01	0.51	3.51	2.92	0.59	1.54	1.31	0.23
33	9.10	7.50	1.60	3.90	3.15	0.75	2.60	2.20	0.40	2.60	1.96	0.64	3.74	3.04	0.70	1.68	1.34	0.34
34	8.50	7.30	1.20	3.30	2.70	0.60	2.30	1.90	0.40	2.78	2.28	0.50	4.10	3.32	0.78	1.59	1.27	0.22
35	8.60	7.90	0.70	3.50	3.10	0.40	2.45	2.15	0.30	2.68	2.45	0.23	4.00	3.37	0.63	1.63	1.29	0.34
36	9.45	8.00	1.45	3.85	2.15	1.70	2.65	2.15	0.50	2.74	2.16	0.58	4.23	3.09	0.74	1.70	1.30	0.40
37	8.65	7.50	1.15	3.75	3.20	0.55	2.60	2.25	0.35	2.58	2.16	0.42	3.76	3.00	0.76	1.57	1.27	0.30
38	8.65	7.40	1.25	3.60	2.80	0.80	2.60	2.05	0.55	2.93	2.14	0.79	3.95	3.06	0.89	1.66	1.08	0.58
39	8.65	7.50	1.15	3.65	3.20	0.45	2.60	2.25	0.35	2.62	2.17	0.45	3.76	2.89	0.87	1.52	1.23	0.29
40	8.40	7.30	1.10	3.90	3.40	0.50	2.65	2.25	0.40	2.41	1.97	0.44	3.50	2.92	0.58	1.70	1.28	0.42
41	8.75	7.40	1.35	3.50	3.15	0.35	2.50	2.20	0.30	2.78	2.16	0.62	3.66	3.08	0.58	1.50	1.31	0.19
42	8.40	7.40	1.00	3.50	3.10	0.40	2.50	2.10	0.40	2.52	2.17	0.35	3.74	3.08	0.66	1.67	1.30	0.37
43	8.20	7.50	0.70	3.50	3.20	0.30	2.45	2.20	0.25	2.56	2.20	0.36	3.57	3.19	0.38	1.51	1.31	0.20
44	10.00	8.65	1.35	2.70	2.10	0.60	2.10	1.90	0.20	4.44	3.50	0.94	4.87	4.12	0.75	1.29	1.05	0.24
45	8.95	7.90	1.05	3.50	2.85	0.65	2.40	2.00	0.40	3.00	2.36	0.64	4.48	3.51	0.97	1.75	1.19	0.56
46	8.70	7.60	1.10	3.50	3.00	0.50	2.45	2.10	0.35	2.81	2.22	0.59	3.82	3.29	0.53	1.62	1.25	0.37
47	8.15	7.15	1.00	3.50	3.05	0.45	2.50	2.10	0.40	2.61	2.13	0.58	3.88	2.98	0.90	1.60	1.27	0.33
48	8.50	7.25	1.25	3.70	3.25	0.45	2.60	2.30	0.30	2.51	2.04	0.47	3.42	2.84	0.58	1.54	1.25	0.29
49	8.90	7.70	1.20	3.40	3.00	0.40	2.50	2.15	0.35	2.83	2.30	0.53	3.96	3.08	0.88	1.50	1.26	0.24
50	8.50	7.40	1.10	3.50	2.90	0.60	2.45	2.10	0.35	2.60	2.34	0.26	3.64	3.23	0.41	1.51	1.29	0.22
51	9.40	8.20	1.20	3.00	2.70	0.30	2.35	2.00	0.35	3.36	2.93	0.43	4.60	3.68	0.92	1.46	1.19	0.27
52	8.50	7.30	1.20	3.35	3.00	0.35	2.40	2.00	0.40	2.70	2.25	0.45	4.08	3.23	0.85	1.63	1.28	0.35
53	10.20	8.80	1.40	2.85	2.20	0.65	2.25	1.90	0.35	4.46	3.18	1.28	5.05	4.02	1.03	1.35	1.07	0.28
54	10.05	8.45	1.60	2.70	2.15	0.55	2.15	1.80	0.35	4.28	3.44	0.84	5.29	4.23	1.06	1.33	1.10	0.23
55	10.65	8.80	1.85	2.80	2.40	0.40	2.10	1.80	0.30	4.26	3.33	0.93	5.44	4.40	1.04	1.46	1.20	0.26
56	10.50	9.25	1.25	3.00	2.60	0.40	2.10	1.85	0.25	3.87	3.28	0.59	5.41	4.52	0.89	1.54	1.29	0.25
57	10.10	9.30	0.80	3.25	2.50	0.75	2.20	1.95	0.25	3.90	2.99	0.91	5.00	4.37	0.63	1.55	1.24	0.31
58	10.75	9.50	1.25	2.80	2.50	0.30	2.15	1.90	0.25	4.28	3.64	0.64	5.25	4.78	0.47	1.33	1.22	0.11
59	9.65	8.55	1.10	3.35	2.90	0.45	2.30	1.90	0.40	3.22	2.71	0.51	4.80	3.89	0.91	1.63	1.38	0.25
60	9.30	7.70	1.60	3.50	2.70	0.80	2.40	1.95	0.45	3.32	2.39	0.93	4.54	3.59	0.95	1.75	1.35	0.40
61	8.10	6.90	1.20	3.40	2.90	0.50	2.40	2.10	0.30	2.60	2.22	0.38	3.77	2.88	0.89	1.51	1.25	0.26
62	8.00	7.35	0.65	2.60	2.25	0.35	1.90	1.65	0.25	3.39	3.00	0.39	4.71	4.03	0.68	1.53	1.28	0.25
63	8.50	7.40	1.10	3.50	2.90	0.60	2.40	2.10	0.30	2.79	2.31	0.48	3.86	3.25	0.61	1.51	1.26	0.25
64	8.45	7.40	1.05	3.70	3.05	0.65	2.40	2.10	0.30	2.74	2.17	0.57	3.75	3.08	0.67	1.64	1.29	0.35

their range are shown. The longest (10.80 mm) was obtained in Nos. 17, 27 and 28. The shortest (8.00 mm) was noted in No. 62, followed by No. 61 (8.10 mm) and Nos. 2 and 47 (8.15 mm). Average and its s.d. through the whole strains were found to be 9.35 ± 0.86.

Minimum: The longest (9.55 mm) was obtained in No. 28, followed by No. 58 (9.50 mm) and No. 14 (9.40 mm). The shortest (6.50 mm) was noted in No. 23, followed by No. 61 (6.90 mm) and No. 2 (7.10 mm). Average and its s.d. through the whole strains were found to be 8.05 ± 0.74.

Range: The largest (2.30 mm) was obtained in No. 23, followed by No. 4 (2.15 mm) and Nos. 7 and 17 (1.95 mm). The smallest (0.65 mm) was noted in No. 62, which was the same as in case of the maximum, followed by Nos. 35 and 43 (0.70 mm). Average and its s.d. through the whole strains were found to be 1.29 ± 0.35.

2. Widths in UHG

Maximum: The widest (3.90 mm) was obtained in Nos. 33 and 40, followed by Nos. 31 and 36 (3.85 mm). The narrowest (2.60 mm) was noted in No. 62, which was the same as in cases of the maximum and of the range of L, followed by Nos. 44 and 54 (2.70 mm). Average and its s.d. through the whole strains were found to be 3.35 ± 0.30.

Minimum: The widest (3.40 mm) was obtained in No. 40, followed by No. 48 (3.25 mm) and Nos. 37, 39 and 43 (3.20 mm). The narrowest (2.00 mm) was noted in No. 23, which was the same as in case of the minimum of L, followed by Nos. 9 and 44 (2.10 mm). Average and its s.d. through the whole strains were found to be 2.75 ± 0.33.

Range: The largest (1.70 mm) was obtained in No. 36, followed by No. 23 (1.45 mm) and No. 9 (1.15 mm). The smallest (0.30 mm) was noted in Nos. 14, 24, 43, 51 and 58. Average and its s.d. through the whole strains were found to be 0.61 ± 0.26.

3. Thicknesses in UHG

Maximum: The thickest (2.65 mm) was obtained in Nos. 15, 36 and 40. The thinnest (1.90 mm) was noted in No. 62, which was the same as in cases of the maxima of L and W, and of the range of L, followed by Nos. 44, 55 and 56 (2.10 mm). Average and its s.d. through the whole strains were found to be 2.38 ± 0.16.

Minimum: The thickest (2.30 mm) was obtained in No. 48, followed by Nos. 32, 37, 39 and 40 (2.25 mm). These combinations of strains were found to be the same as in case of the minimum of W. The thinnest (1.65 mm) was noted in Nos. 2 and 62, followed by No. 9 (1.70 mm). Average and its s.d. through the whole strains were found to be 2.01 ± 0.15.

Range: The largest (0.70 mm) was obtained in No. 8, followed by Nos. 15 and 23 (0.60 mm). The smallest (0.15 mm) was noted in No. 29, followed by No. 44 (0.20 mm). Average and its s.d. through the whole strains were found to be 0.37 ± 0.11.

4. Ratios of length to width (L/W) in UHG

Maximum: The largest (4.46) was obtained in No. 53, followed by No. 44 (4.44) and Nos. 54 and 58 (4.28). The smallest (2.41) was noted in No. 40, followed by No. 48 (2.51) and Nos. 32 and 42 (2.52). Average and its s.d. through the whole strains were found to be 3.23 ± 0.57.

Minimum: The largest (3.57) was obtained in No. 11, followed by No. 44 (3.50) and No. 54 (3.44). The smallest (1.91) was noted in No. 23, which was the same as in cases of the minima of L and W, followed by No. 33 (1.96) and No. 40 (1.97). Average and its s.d. through the whole strains were found to be 2.58 ± 0.45.

Range: The largest (1.28) was obtained in No. 53, which was the same as in case of the maximum of L/W, followed by No. 25 (1.17) and No. 5 (1.10). The smallest (0.23) was noted in No. 35, followed by No. 50 (0.26) and No. 19 (0.33). Average and its s.d. through the whole strains were found to be 0.65 ± 0.24.

5. Ratios of length to thickness (L/T) in UHG

Maximum: The largest (5.65) was obtained in No. 11, which was the same as in case of the minimum of L/W, followed by No. 55 (5.44) and No. 56 (5.41). The smallest (3.42) was noted in No. 48, followed by No. 40 (3.50) and No. 32 (3.51). 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 4.43 ± 0.57.

Minimum: The largest (4.78) was obtained in No. 58, followed by No. 56 (4.52) and Nos. 11 and 14 (4.48). The smallest (2.75) was noted in No. 23, which was the same as in cases of the minima of L, W and L/W, followed by No. 48 (2.84) and No. 61 (2.88). Average and its s.d. through the whole strains were found to be 3.58 ± 0.50.

Range: The largest (1.50) was obtained in No. 2, followed by No. 23 (1.44) and No. 11 (1.17). The smallest (0.38) was noted in No. 43, followed by No. 50 (0.41) and No. 58 (0.47). Average and its s.d. through the whole strains were found to be 0.83 ± 0.23.

6. Ratios of width to thickness (W/T) in UHG

Maximum: The largest (1.85) was obtained in No. 2, which was the same as in case of the range of L/T, followed by Nos. 45 and 60 (1.75). The smallest (1.29) was noted in No. 44, followed by Nos. 54 and 58 (1.33). Average and its s.d. through the whole strains were found to be 1.55 ± 0.10.

Minimum: The largest (1.39) was obtained in No. 2, which was the same as in cases of the range of L/T and of the maximum of W/T, followed by No. 59 (1.38) and No. 60 (1.35). The smallest (1.05) was noted in No. 44, which was the same as in case of the maximum of W/T, followed by No. 15 (1.06) and No. 53 (1.07). Average and its s.d. through the whole strains were found to be 1.24 ± 0.07.

Range: The largest (0.60) was obtained in No. 15, followed by No. 38 (0.58) and No. 45 (0.56). The smallest (0.11) was noted in No. 58, followed by No. 41 (0.19) and No. 14 (0.21). It was noted that the value was particularly small in No. 58. Average and its s.d. through the whole strains were found to be 0.31 ± 0.09.

7. Lengths in HG

Maximum: The results are given in Table 4. In this table, the maximum, the minimum and their range are shown. The longest (7.90 mm) was obtained in No. 14, followed by No. 58 (7.70 mm) and Nos. 22, 28 and 55 (7.55 mm). These combinations of strains were found to be the same as in case of the minimum of L (UHG). The shortest (5.55 mm) was noted in No. 62, which was the same as in cases of the maxima of L, W and T, and of the range of L (UHG), followed by No. 43 (5.75 mm) and Nos. 2 and 61 (5.80 mm). These combinations of strains were found to be the same as in case of the maximum of L (UHG). Average and its s.d. through the whole strains were found to be 6.58 ± 0.61.

Minimum: The longest (6.90 mm) was obtained in No. 58, which was the same as in case of the minimum of L/T (UHG), followed by No. 28 (6.80 mm) and Nos. 55 and 57 (6.70 mm). The

Table 4. 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	6.90	5.75	1.15	2.90	2.50	0.40	2.30	1.90	0.40	2.48	2.12	0.36	3.29	2.78	0.51	1.45	1.09	0.36
2	5.08	5.10	0.70	3.05	2.35	0.70	2.10	1.40	0.70	2.34	1.74	0.60	3.93	2.52	1.41	1.68	1.38	0.30
3	6.40	5.70	0.70	2.70	2.10	0.60	2.10	1.70	0.40	2.84	2.15	0.69	3.68	2.71	0.97	1.39	1.05	0.34
4	6.75	5.00	1.75	2.70	1.90	1.20	2.15	1.65	0.50	2.90	2.14	0.76	3.39	2.78	0.61	1.42	1.05	0.37
5	7.45	6.00	1.45	2.70	2.00	0.70	2.05	1.70	0.35	3.25	2.24	1.01	4.11	2.95	1.16	1.36	1.14	0.22
6	6.55	5.90	0.65	3.00	2.30	0.70	2.20	1.85	0.35	2.80	2.03	0.77	3.45	2.79	0.66	1.49	1.20	0.29
7	7.45	6.00	1.45	2.80	2.00	0.80	2.30	1.80	0.50	3.36	2.30	1.06	3.76	2.79	0.97	1.40	1.10	0.30
8	6.20	5.15	1.05	2.90	2.00	0.90	2.25	1.55	0.70	2.93	1.88	1.05	3.87	2.55	1.32	1.56	1.14	0.42
9	6.25	5.20	1.05	2.80	1.80	1.00	2.05	1.60	0.45	3.06	2.14	0.92	3.63	2.74	0.89	1.37	1.09	0.28
10	6.50	5.70	0.80	2.80	2.20	0.60	2.10	1.65	0.45	2.77	2.24	0.53	3.58	2.83	0.75	1.37	1.12	0.25
11	6.90	5.80	1.10	2.35	2.00	0.35	2.00	1.60	0.40	3.24	2.76	0.48	4.18	3.25	0.93	1.42	1.14	0.28
12	6.45	5.65	0.80	2.85	2.55	0.30	2.20	1.85	0.35	2.44	2.17	0.27	3.35	2.71	0.64	1.47	1.16	0.31
13	6.20	5.40	0.80	3.00	2.40	0.60	2.20	1.85	0.35	2.38	1.90	0.48	3.10	2.59	0.51	1.45	1.14	0.31
14	7.90	6.40	1.50	2.45	2.10	0.35	2.00	1.75	0.25	3.55	2.83	0.72	4.14	3.46	0.68	1.32	1.10	0.22
15	6.85	6.25	0.60	2.90	2.50	0.40	2.40	1.85	0.55	2.74	2.22	0.52	3.57	2.73	0.84	1.51	1.04	0.47
16	7.40	6.20	1.20	2.70	2.10	0.60	2.10	1.70	0.40	3.36	2.47	0.81	4.03	3.05	0.98	1.33	1.10	0.23
17	7.45	6.15	1.30	2.70	2.30	0.40	2.10	1.70	0.40	3.15	2.37	0.78	3.83	3.12	0.71	1.39	1.12	0.27
18	6.15	5.50	0.65	2.70	2.30	0.40	2.10	1.80	0.30	2.65	2.15	0.50	3.36	2.74	0.63	1.44	1.10	0.34
19	6.05	5.50	0.55	2.85	2.60	0.25	2.20	1.80	0.40	2.24	2.04	0.20	3.33	2.67	0.66	1.53	1.24	0.29
20	7.20	6.15	1.05	2.90	2.40	0.50	2.20	1.80	0.40	2.74	2.33	0.41	3.42	2.82	0.60	1.44	1.14	0.30
21	6.95	6.00	0.95	3.00	2.40	0.60	2.10	1.80	0.30	2.75	2.18	0.57	3.58	3.05	0.53	1.50	1.20	0.30
22	7.55	6.40	1.15	2.45	2.00	0.45	2.00	1.70	0.30	3.41	2.71	0.70	4.08	3.37	0.71	1.46	1.10	0.36
23	6.00	4.55	1.45	2.95	2.60	0.35	2.40	1.80	0.60	2.18	1.57	0.61	3.16	2.08	1.08	1.56	1.13	0.43
24	6.45	5.85	0.60	2.75	2.40	0.35	2.15	1.85	0.30	2.58	2.22	0.36	3.35	2.88	0.47	1.43	1.19	0.24
25	6.55	5.60	0.95	2.70	2.00	0.70	2.05	1.75	0.30	3.28	2.15	1.13	3.64	2.93	0.71	1.41	1.08	0.33
26	6.50	5.70	0.80	3.20	2.45	0.75	2.25	1.90	0.35	2.49	1.89	0.60	3.25	2.64	0.61	1.60	1.23	0.37
27	7.45	6.30	1.15	2.50	2.10	0.40	2.05	1.80	0.25	3.24	2.66	0.58	3.89	3.15	0.74	1.32	1.08	0.24
28	7.55	6.80	0.75	2.80	2.25	0.55	2.10	1.85	0.25	3.22	2.72	0.50	3.87	3.33	0.54	1.39	1.10	0.29
29	7.45	6.65	0.80	2.70	2.25	0.45	2.05	1.90	0.15	3.20	2.67	0.53	3.82	3.24	0.58	1.35	1.15	0.20
30	6.40	5.75	0.65	2.80	2.20	0.60	2.20	1.80	0.40	2.80	2.11	0.69	3.44	2.64	0.80	1.42	1.10	0.32
31	7.50	6.35	1.15	3.30	2.80	0.50	2.20	1.90	0.30	2.60	2.07	0.53	3.68	2.89	0.79	1.68	1.32	0.36

Table 4. (Continued)

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
32	5.95	5.00	0.95	3.25	2.70	0.55	2.35	2.00	0.35	2.00	1.61	0.39	2.80	2.17	0.63	1.63	1.30	0.33
33	6.40	5.50	0.90	3.50	2.70	0.80	2.40	2.00	0.40	2.22	1.59	0.63	2.93	2.36	0.57	1.70	1.26	0.44
34	6.00	5.20	0.80	2.80	2.30	0.50	2.05	1.70	0.35	2.33	1.91	0.42	3.33	2.60	0.73	1.59	1.20	0.39
35	6.00	5.60	0.40	3.00	2.60	0.40	2.25	1.95	0.30	2.31	2.00	0.31	3.08	2.58	0.50	1.49	1.18	0.31
36	6.65	5.70	0.95	3.40	2.95	0.45	2.40	1.95	0.45	2.14	1.75	0.39	3.17	2.44	0.73	1.64	1.29	0.35
37	6.15	5.30	0.85	3.25	2.80	0.45	2.30	2.05	0.25	2.10	1.74	0.36	2.93	2.35	0.68	1.49	1.26	0.23
38	6.15	5.30	0.85	3.25	2.40	0.85	2.40	1.85	0.55	2.46	1.66	0.80	3.14	2.41	0.73	1.62	1.00	0.62
39	6.05	5.40	0.65	3.20	2.80	0.40	2.40	2.00	0.40	2.05	1.77	0.28	2.93	2.25	0.68	1.54	1.17	0.37
40	6.00	5.35	0.65	3.30	2.90	0.40	2.45	2.00	0.45	2.00	1.69	0.31	2.75	2.29	0.46	1.55	1.18	0.37
41	6.05	5.30	0.75	3.05	2.80	0.25	2.30	2.00	0.30	2.16	1.77	0.39	2.85	2.35	0.50	1.45	1.26	0.19
42	6.00	5.20	0.80	3.15	2.90	0.25	2.30	1.90	0.40	2.02	1.68	0.34	2.97	2.36	0.61	1.63	1.29	0.34
43	5.75	5.30	0.45	3.10	2.80	0.30	2.25	2.00	0.25	2.02	1.74	0.28	2.71	2.41	0.30	1.48	1.27	0.21
44	6.85	6.00	0.85	2.35	1.95	0.40	1.90	1.70	0.20	3.40	2.89	0.51	3.83	3.29	0.54	1.27	1.05	0.22
45	6.45	5.70	0.75	3.00	2.60	0.40	2.20	1.70	0.50	2.39	1.93	0.46	3.79	2.73	1.06	1.59	1.18	0.41
46	6.25	5.40	0.85	3.15	2.80	0.35	2.25	1.90	0.35	2.14	1.71	0.43	3.00	2.55	0.45	1.63	1.27	0.36
47	5.85	5.00	0.85	3.15	2.55	0.60	2.25	1.90	0.35	2.12	1.74	0.38	3.08	2.27	0.81	1.53	1.16	0.37
48	6.00	5.20	0.80	3.20	2.80	0.40	2.40	2.10	0.30	2.05	1.65	0.40	2.59	2.21	0.38	1.45	1.17	0.28
49	6.25	5.50	0.75	3.10	2.65	0.45	2.30	1.95	0.35	2.34	1.80	0.54	3.05	2.39	0.66	1.50	1.22	0.28
50	5.85	5.30	0.55	3.15	2.60	0.55	2.25	1.90	0.35	2.11	1.84	0.27	2.84	2.46	0.38	1.46	1.23	0.23
51	6.70	5.80	0.90	2.60	2.30	0.70	2.10	1.80	0.30	2.75	2.42	0.33	3.62	3.00	0.62	1.41	1.14	0.27
52	6.00	5.05	0.95	3.05	2.70	0.35	2.20	1.80	0.40	2.11	1.71	0.40	3.25	2.49	0.76	1.64	1.29	0.35
53	7.05	5.75	1.20	2.40	1.95	0.45	2.05	1.70	0.35	3.44	2.74	0.70	3.94	3.22	0.68	1.28	1.08	0.20
54	6.75	5.90	0.85	2.30	1.95	0.35	1.95	1.60	0.35	3.30	2.75	0.55	3.97	3.28	0.69	1.31	1.11	0.20
55	7.55	6.70	0.85	2.45	2.05	0.40	1.85	1.60	0.25	3.45	2.89	0.56	4.47	3.68	0.79	1.44	1.14	0.30
56	7.35	6.50	0.85	2.55	2.20	0.35	1.90	1.65	0.25	3.20	2.60	0.60	4.24	3.63	0.61	1.50	1.21	0.29
57	7.50	6.70	0.80	2.65	2.15	0.50	2.00	1.70	0.30	3.23	2.68	0.55	4.06	3.53	0.53	1.44	1.13	0.31
58	7.70	6.90	0.80	2.40	2.10	0.30	1.90	1.70	0.20	3.58	3.00	0.58	4.27	3.68	0.59	1.26	1.14	0.12
59	6.90	6.20	0.70	2.85	2.50	0.35	2.10	1.70	0.40	2.65	2.28	0.37	3.77	3.10	0.67	1.54	1.32	0.22
60	6.50	5.10	1.40	3.00	2.25	0.75	2.20	1.80	0.40	2.77	1.93	0.84	3.51	2.65	0.86	1.67	1.24	0.43
61	5.80	4.90	0.90	2.80	2.40	0.40	2.20	1.90	0.30	2.25	1.88	0.37	2.90	2.23	0.67	1.37	1.14	0.23
62	5.55	5.00	0.55	2.20	1.95	0.25	1.70	1.40	0.30	2.75	2.38	0.37	3.75	3.18	0.57	1.47	1.25	0.22
63	5.90	5.40	0.50	3.00	2.50	0.50	2.20	1.90	0.30	2.28	1.90	0.38	2.95	2.50	0.45	1.43	1.16	0.27
64	6.05	5.25	0.80	3.40	2.70	0.70	2.20	1.90	0.30	2.13	1.75	0.38	2.98	2.46	0.52	1.66	1.27	0.39

shortest (4.55 mm) was noted in No. 23, which was the same as in cases of the minima of L, W, L/W and L/T (UHG), followed by No. 61 (4.90 mm) and Nos. 4, 32, 47 and 62 (5.00 mm). Average and its s.d. through the whole strains were found to be 5.69 ± 0.53.

Range: The largest (1.75 mm) was obtained in No. 4, followed by No. 14 (1.50 mm) and Nos. 5, 7 and 23 (1.45 mm). The smallest (0.40 mm) was noted in No. 35, which was the same as in case of the range of L/W (UHG), followed by No. 43 (0.45 mm) and No. 63 (0.50 mm). Average and its s.d. through the whole strains were found to be 0.89 ± 0.28.

8. Widths in HG

Maximum: The widest (3.50 mm) was obtained in No. 33, followed by Nos. 36 and 64 (3.40 mm). The narrowest (2.20 mm) was noted in No. 62, which was the same as in cases of the maxima of L (UHG and HG), W (UHG) and T (UHG), and of the range of L (UHG), followed by No. 54 (2.30 mm) and No. 44 (2.35 mm). These combinations of strains were found to be the same as in case of the maximum of W (UHG). Average and its s.d. through the whole strains were found to be 2.87 ± 0.30.

Minimum: The widest (2.95 mm) was obtained in No. 36, which was the same as in case of the range of W (UHG), followed by Nos. 40 and 42 (2.90 mm). The narrowest (1.80 mm) was noted in No. 9, followed by No. 4 (1.90 mm) and Nos. 44, 53, 54 and 62 (1.95 mm). Average and its s.d. through the whole strains were found to be 2.38 ± 0.31.

Range: The largest (1.20 mm) was obtained in No. 4, which was the same as in case of the range of L (HG), followed by No. 9 (1.00 mm) and No. 8 (0.90 mm). The smallest (0.25 mm) was noted in Nos. 19, 41, 42 and 62. Average and its s.d. through the whole strains were found to be 0.51 ± 0.91.

9. Thicknesses in HG

Maximum: The thickest (2.45 mm) was obtained in No. 40, which was the same as in case of the minimum of W (UHG), followed by Nos. 15, 23, 33, 36, 38, 39 and 48 (2.40 mm). These combinations of strains were found to be the same as in case of the minimum of W (UHG). The thinnest (1.70 mm) was noted in No. 62, which was the same as in cases of the maxima of L (UHG and HG), W (UHG and HG) and T (UHG), and of the range of L (UHG), followed by Nos. 44, 56 and 58 (1.90 mm). These orders of strains were found to be the same as in case of the maximum of T (UHG). Average and its s.d. through the whole strains were found to be 2.17 ± 0.15.

Minimum: The thickest (2.10 mm) was obtained in No. 48, which was the same as in case of the minimum of T (UHG), followed by No. 37 (2.05 mm) and Nos. 32, 33, 39, 40, 41 and 43 (2.00 mm). The thinnest (1.40 mm) was noted in Nos. 2 and 62, which were the same as in case of the minimum of T (UHG), followed by No. 8 (1.55 mm). Average and its s.d. through the whole strains were found to be 1.80 ± 0.15.

Range: The largest (0.70 mm) was obtained in Nos. 2 and 8, followed by No. 23 (0.60 mm). These combinations of strains were found to be the same as in case of the range of T (UHG). The smallest (0.15 mm) was noted in No. 29, which was the same as in case of the range of T (UHG), followed by Nos. 44 and 58 (0.20 mm). These combinations of strains were found to be the same as in case of the range of T (UHG). Average and its s.d. through the whole strains were found to be 0.37 ± 0.11.

10. Ratios of length to width (L/W) in HG

Maximum: The largest (3.58) was obtained in No. 58, which was the same as in cases of the minima of L (HG) and L/T (UHG), followed by No. 14 (3.55) and No. 55 (3.45). These combinations of strains were found to be the same as in case of the maximum of L (HG). The smallest (2.00) was noted in Nos. 32 and 40, followed by Nos. 42 and 43 (2.02). Average and its s.d. through the whole strains were found to be 2.68 ± 0.49.

Minimum: The largest (3.00) was obtained in No. 58, which was the same as in cases of the maximum of L/W (HG), of the minima of L (HG) and L/T (UHG), followed by Nos. 44 and 55 (2.89). The smallest (1.57) was noted in No. 23, which was the same as in cases of the minima of L, W, L/W and L/T (UHG), of the minimum of L (HG), followed by No. 33 (1.59) and No. 32 (1.61). Average and its s.d. through the whole strains were found to be 2.13 ± 0.39.

Range: The largest (1.13) was obtained in No. 25, followed by No. 7 (1.06) and No. 8 (1.05). The smallest (0.20) was noted in No. 19, followed by Nos. 12 and 50 (0.27). Average and its s.d. through the whole strains were found to be 0.54 ± 0.21.

11. Ratios of length to thickness (L/T) in HG

Maximum: The largest (4.47) was obtained in No. 55, followed by No. 58 (4.27) and No. 56 (4.24). The smallest (2.59) was noted in No. 48, which was the same as in case of the maximum of L/T (UHG), followed by No. 43 (2.71) and No. 40 (2.75). Average and its s.d. through the whole strains were found to be 3.47 ± 0.46.

Minimum: The largest (3.68) was obtained in Nos. 55 and 58, followed by No. 56 (3.63). These combinations of strains were found to be the same as in case of the maximum of L/T (HG). The smallest (2.08) was noted in No. 23, which was the same as in cases of the minima of L (UHG and HG), W (UHG), L/W (UHG and HG) and L/T (UHG), followed by No. 32 (2.17) and No. 48 (2.21). Average and its s.d. through the whole strains were found to be 2.78 ± 0.40.

Range: The largest (1.41) was obtained in No. 2, which was the same as in cases of the range of L/T (UHG), of the maximum and of the minimum of W/T (UHG), followed by No. 8 (1.32) and No. 5 (1.16). It was noted that the values were particularly large in Nos. 2 and 8. The smallest (0.30) was noted in No. 43, which was the same as in case of the range of L/T (UHG), followed by Nos. 48 and 50 (0.38). Average and its s.d. through the whole strains were found to be 0.69 ± 0.21.

12. Ratios of width to thickness (W/T) in HG

Maximum: The largest (1.70) was obtained in No. 33, which was the same as in case of the maximum of W (HG), followed by Nos. 2 and 31 (1.68). The smallest (1.26) was noted in No. 58, which was the same as in case of the range of W/T (UHG), followed by No. 44 (1.27) and No. 53 (1.28). Average and its s.d. through the whole strains were found to be 1.48 ± 0.11.

Minimum: The largest (1.38) was obtained in No. 2, which was the same as in cases of the minima of L/T (UHG and HG), and of the maximum and of the minimum of W/T (UHG), followed by Nos. 31 and 59 (1.32). The smallest (1.00) was noted in No. 38, followed by No. 15 (1.04) and Nos. 3, 4 and 44 (1.05). Average and its s.d. through the whole strains were found to be 1.17 ± 0.08.

Range: The largest (0.62) was obtained in No. 38, followed by No. 15 (0.47) and No. 33 (0.44). The smallest (0.12) was noted in No. 58, which was the same as in cases of the maximum of W/T (HG) and of the range of W/T (UHG), followed by No. 41 (0.19) and Nos. 53 and 54 (0.20). Average and its s.d. through the whole strains were found to be 0.31 ± 0.08.

Discussion

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

Comparative values

1. In L/W, nearly the largest (0.87) was obtained in No. 57. This value was attributable both to nearly the largest value (0.73) in L and relatively small value (0.85) in W. On the other hand, nearly the smallest (0.78) was noted in No. 52, too. This value was attributable to both nearly the smallest value (0.71) in L and the largest value (0.91) in W. In L/T, the largest (0.82) was obtained in No. 31. This value was attributable to both nearly the largest value (0.73) in L and nearly the smallest value (0.90) in T. On the other hand, the smallest (0.76) was noted in No. 48. This value was attributable to both nearly the smallest value (0.70) in L and the largest value (0.92) in T. In W/T, the largest (1.01) was obtained in No. 32. This value was attributable to both nearly the largest value (0.90) in W and nearly the smallest value (0.89) in T. On the other hand, the smallest (0.86) was noted in No. 7. This value was attributable to both the smallest value (0.78) in W and nearly the largest value (0.91) in T.

In quotient of areas, the largest value (0.65) was obtained in No. 52. This value was attributable to the small value (24.85 mm^2) in UHG. On the other hand, nearly the smallest value (0.55) was noted in No. 15. This value was attributable to nearly the largest value (31.75 mm^2) in UHG. In quotient of volumes, the largest value (0.59) was also obtained in No. 52. This value was attributable to the small value (56.21 mm^3) in UHG. On the other hand, nearly the largest value (0.50) was also noted in No. 15. This value was attributable to nearly the largest value (71.43 mm^3) in UHG. In general, these analyses in the quotients were fixed to be more difficult than that in case of the comparative characters.

2. Although the values were particularly large or small in some characters, the values were found to be the standard level in other characters in view of the same strains. For example, No. 29 showed the largest value (0.74) in L, but showed the middle value (0.85) in W. In another case, No. 11 showed the smallest value (0.66) in L, but showed the middle value (0.83) in W.

Although the values were particularly large in some characters, the values were found to be quite small in the other characters in view of the same strains, and *vice versa*. For example, No. 46 showed the largest value (0.91) in W, but showed nearly the smallest value (0.78) in L/W. These phenomena were found in a few combinations.

In view of area and volume characters, it was ascertained that the larger is the value of one character, the larger is the value of another character.

3. In view of s.d., the following items were ascertained to some extent. As the values of s.d. of the comparative columns were ascertained to be very small, the considerations were done only in the area and volume columns. In general, the larger is s.d. in some character, the larger is s.d. in another character. For example, No. 9 showed the largest s.d. (3.29) in area (UHG), and showed also the largest s.d. (1.89) in area (HG). However, some exceptions were found. For example, No. 14 showed nearly the smallest s.d. (1.11) in area (UHG), but showed the middle s.d. (1.08) in area (HG).

In general, the larger is the practical value, the larger is its s.d. For example, No. 62 showed the smallest value (32.32 mm^3) and also the smallest s.d. (2.08) in volume (UHG). However, some

exceptions were found. For example, No. 9 showed nearly the smallest value (19.87 mm^2) and the largest s.d. (3.29) in area (UHG). These discrepancies may be looked upon as an expression of as evolutional meanings. But it was left inexplicable in the present time. It was noticeable that Nos. 4, 8 and 9, and Nos. 43, 45 and 62 showed always the large s.d. and the small s.d. through the whole area and volume characters, respectively. All of the strains mentioned above were fixed to be belonging to type C in accordance with the tripartite classifications[4], which was the same as in case of the Indian strains[3].

4. In comparison of type B with type C made in accordance with the tripartite classifications, the following items were ascertained. Type B (13 strains, *i.e.*, Nos. 1, 7, 15, 20, 21, 26, 28, 31, 33, 36, 39, 40, 48) showed some general features as follows; the values of L/W, areas and volumes (UHG and HG) were found to be larger than average of the whole strains (=64); values of L, T, L/T and quotient of volumes were found to be the same as in it; and the values of W, W/T and quotient of areas were found to be smaller than in it. It was noted that s.d. in the 4 characters were clearly fixed to be larger than average of the whole strains.

In type C (the remaining 51 strains), the values of areas and volumes (UHG and HG) were found to be smaller than average of the whole strains; the values of the remaining 8 characters were found to be smaller than in it. It was noted that s.d. in the 4 characters were clearly fixed to be smaller than average of the whole strains, formally making a striking contrast to type B. These facts meant that type B (=*javanica*) are looked upon as variable features in Burma and having shorter history than those of type C (=*indica*). These findings proposed an interesting problem on the locality-specificities, strain-differentiations and migration patterns of the native peoples.

5. In the smaller sets of W and W/T, the smallest ones (0.78 in W and 0.86 in W/T) were noted in No. 7, followed by Nos. 15 and 16 (0.80 in W and 0.89 in W/T). These orders of strains were finally illustrated as $7<15=16$. These orders of strains were fixed to be the same both in W and W/T. These phenomena were found in the other 4 cases, *i.e.*, ② $62<9<54$ ··· No. 62 (18.40 mm^2, 32.32 mm^3, 11.27 mm^2 and 17.40 mm^3), No. 9 (19.87 mm^2, 37.99 mm^3, 11.67 mm^2 and 20.12 mm^3) and No. 54 (21.06 mm^2, 40.81 mm^3, 12.90 mm^2 and 22.48 mm^3) in the smaller sets of area (UHG), volume (UHG), area (HG) and volume (HG); ③ $11<7=15$ ··· No. 11 (0.54 and 0.49) and Nos. 7 and 15 (0.55 and 0.50) in the smaller sets of quotients of areas and volumes; ④ $9>4>8$ ··· No. 9 (3.29 and 1.89), No. 4 (2.57 and 1.66) and No. 8 (2.49 and 1.64) in the larger sets of s.d. of areas (UHG and HG); ⑤ $8>9>4$ ··· No. 8 (9.45 and 5.55), No. 9 (9.19 and 5.01) and No. 4 (7.37 and 4.29) in the larger sets of s.d. of volumes (UHG and HG).

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 orders. Five cases were ascertained as follows, *i.e.*, ① 29·31·57 in the larger sets ··· L ($29>31=57$) and L/T ($29=31>57$); ② 10·11·15·27·54 in the smaller sets ··· L ($11<10=15=27=54$) and L/T ($11<10<15=27=54$); ③ 31·33·36 in the larger sets ··· area of HG ($31>36>33$) and volume of HG ($36>31>33$); ④ 42·46·49·52 in the larger sets ··· quotient of areas ($42=46=49=52$) and quotient of volumes ($42=46=49=52$); ⑤ 4·8·9 in the larger sets of s.d. ··· area of UHG ($9>4>8$), volume of UHG ($8>9>4$), area of HG ($9>4>8$) and volume of HG ($8>9>4$).

It was noticeable that these synchronized orders and combinations of strains were found to be fewer cases in the comparative columns than those of areas and volumes columns. It meant that gene actions of these characters were independently expressed of each other. It was also noticeable that the combinations of s.d. in areas and volumes were quite the same ones as in the whole cases of UHG and HG.

Ranges in UHG and HG

1. Although the values were particularly large or small in some characters, the values were found to be the standard level in the other characters in view of the same strains. For example, No. 17 showed the largest value (10.80 mm) in the maximum of L (UHG), but showed the middle value (3.30 mm) in the maximum of W (UHG). In another case, No. 61 showed nearly the smallest value (8.10 mm) in the maximum of L (UHG), but the middle value (3.40 mm) in the maximum of W (UHG).

On the other hand, although the values were particularly large in some characters, the values were found to be particularly small in the other characters in view of the same strains, and *vice versa*. For example, No. 44 showed nearly the largest value (10.00 mm) in the maximum of L (UHG), but showed nearly the smallest value (2.70 mm) in the maximum of W (UHG). In another case, No. 40 showed the large value (8.40 mm) in the maximum of L (UHG), but showed the largest value in the maximum of W (UHG). These phenomena were found in several combinations. In L/W, L/T and W/T, these facts were not ascertained in the present experiment.

2. In comparison of type B with type C made in accordance with the tripartite classification, the following items were ascertained. Type B showed some general features as follows; 24 characters (L, W, T and W/T of the maxima, the minima and the ranges of both of the UHG and HG), and 12 characters (L/W and L/T of the maxima, the minima and the ranges of both of the UHG and HG) showed the larger and the smaller values than those of the average of the whole strains, respectively. It was noticeable that the tendencies were fixed to be quite the same one both in UHG and in HG. In type C, the tendencies were looked upon as having nearly the contrast features with type B, except for the minima of W/T (UHG and HG), and the ranges of T (UHG) and L (HG), in which the values were the same as in average of the whole strains.

3. In the smaller sets of values, the smallest ones (1.90 mm in the maximum of T of UHG and 1.70 mm in the maximum of T of HG) were noted in No. 62, followed by Nos. 44 and 56 (2.10 mm in the maximum of T of UHG and 1.90 mm in the maximum of T of HG). These orders of strains were finally illustrated in these two characters as $62<44=56$. These phenomena were found only in one case mentioned above. It was noticeable that these phenomena were not mutually found between UHG and HG.

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. Twelve cases were found, *i.e.*, ① 37·39·40·48 in the larger sets··· the minimum of W of UHG ($40>48>37=39$) and the minimum of T of UHG ($48>37=39=40$); ② 32·40·48 in the smaller sets··· the maximum of L/W of UHG ($40<48<32$) and the maximum of L/T of UHG ($48<40<32$); ③ 14·55·58 in the larger sets··· the maximum of L of HG ($14>58>55$) and the maximum of L/W of HG ($58>14>55$); ④ 55·56·58 in the larger sets··· the maximum of L/T of HG ($55>58>56$) and the minimum of L/T of HG ($55=58>56$); ⑤ 14·28·58 in the larger sets··· the minimum of L of UHG ($28>58>14$) and the maximum of L of HG ($14>58>28$); ⑥ 39·40·48 in the larger sets··· the minimum of W of UHG ($40>48>39$) and the maximum of T of HG ($40>39=48$); ⑦ 15·36·40 in the larger sets··· the maxima of T of UHG ($15=36=40$) and HG ($40>15=36$); ⑧ 32·37·39·40·48 in the larger sets··· the minima of T of UHG ($48>32=37=39=40$) and HG ($48>37>32=39=40$); ⑨ 2·8·23 in the larger sets··· the ranges of T of UHG ($8>2>23$) and HG ($2=8>23$); ⑩ 2·61·62 in the smaller sets··· the maxima of L of UHG ($62<61<2$) and HG ($62<2=61$); ⑪ 44·54·62 in the smaller sets··· the maxima of W of UHG ($62<44=54$) and HG ($62<54<44$); ⑫ 29·44·58 in the smaller sets··· the ranges of W of UHG ($29<44<58$) and HG ($29<44=58$). It was ascertained

that these synchronized orders and combinations of strains were found to be fewer in the L/W, L/T and W/T characters than in L, W and T.

Summary

In order to confirm the varietal variations of the cultivated rice collected in Burma, comparisons of the unhusked and the husked grains for 12 characters and variation ranges in 12 characters were carried out, following the previous paper. The results obtained here were summarized as follows:

Comparative values of length, width, thickness, L/W, L/T and W/T were measured as 0.71, 0.86, 0.91, 0.83, 0.78 and 0.95 in the average values, respectively. Area (UHG), volume (UHG), area (HG), volume (HG), quotient of areas and quotient of volumes were measured as 26.45 mm^2, 58.46 mm^3, 16.00 mm^2, 32.08 mm^3, 0.61 and 0.55 in average values, respectively. The maximum, the minimum and the range of L, W, T, L/W, L/T and W/T in view of UHG were measured as 9.35 mm, 8.05 mm, 1.29 mm; 3.35 mm, 2.75 mm, 0.61 mm; 2.38 mm, 2.01 mm, 0.37 mm; 3.23, 2.58, 0.65; 4.43, 3.58, 0.83; 1.55, 1.24, 0.31 in average values, respectively. Those in view of HG in the same orders were ascertained as 6.58 mm, 5.69 mm, 0.89 mm; 2.87 mm, 2.38 mm, 0.51 mm; 2.17 mm, 1.80 mm, 0.37 mm; 2.68, 2.13, 0.54; 3.47, 2.78, 0.69; 1.48, 1.17, 0.31 in average values, respectively.

In accordance with the tripartite classifications, some specificities were found. It was noticeable that type B (=*javanica*) are looked upon as having variable features in Burma and having shorter history that those of type C (=*indica*).

Basing on the data obtained in these characters, several patterns were fixed to be varietal variations and strain specificities. Strains showing relatively large or small values in the respective characters were picked-up and grouped as "order" and "combination". These techniques were already fixed as useful ones in testing the strain or geographical differentiations of rice varieties and in analysing the migration of the people.

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