

Grain Morphology of Wild Rice in African Countries (II)

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Introduction

During the periods from October to November in 1984, from August to November in 1985, and from May to August in 1988, the writer was sent to 8 countries of Africa, *i.e.*, Madagascar, Tanzania, Kenya, Nigeria, Ivory Coast, Liberia, Senegal and Gambia, for the collection of wild and cultivated rices under the project, “Studies on the Distribution and Ecotypic Differentiation of Wild and Cultivated Rice Species in Africa”, supported by a Grant from the Ministry of Education, Science and Culture of the Japanese Government. In these opportunities, wild rices distributed in African countries were studied.

On the distribution of wild rice in Africa, some scientific reports have already been published^{3–7,22,24,25}. Although Africa has been considered to be one of the most important distribution areas of the wild rice in the world, accumulation of complete data on these aspects is far from being perfect. Taking these facts into account, the present study-series were made to ascertain exactly the distribution, and the geographical, seasonal and ecotypic differentiations of wild rice in African areas.

Recently, wild *Oryza* species have frequently been studied from several agronomic viewpoints. For example, Sitch *et al.* (1989)²³ studied prefertilization incompatibility barriers in the selected interspecific and intergeneric crosses involving 7 species of 2 genera, *Oryza* and *Rhynchoryza*. Manuel *et al.* (1990)²¹ examined the F₁s from 8 japonica/indica, 6 japonica/japonica-indica, and 2 interspecific crosses including *Oryza sativa* var. *spontanea*, for the view of hybrid sterility. Biaoqi *et al.* (1991)² crossed cultivars with a shorter duration plant selected from the F₂ of *Oryza longistaminata*/*Oryza sativa* var. *spontanea*, in view of breeding the short duration growth. Ahmed *et al.* (1991)¹ tested 33 wild rice accessions from IRRI for reactions to blight. Velusamy (1991)²⁶ evaluated 195 breeding lines derived from *Oryza officinalis* for resistance to brown planthopper. These wild rices mentioned above may be used in the wider ranges of agronomy, *i.e.*, growing period, resistance for several pests and insects, genetic research. These are reasons why wild rice should be studied in global viewpoints.

In the previous papers^{9–15}, the preliminary and advanced data have been published as the results of the first and the second survey trips made in 1984 and 1985, respectively. In the following papers, the results obtained in the third survey trip made in 1988 were reported^{17–19}. Further, in the previous paper else than these²⁰, habitat and the record of the morphological characters of the unhusked grains of wild rices collected in 1984, 1985 and 1988 were described.

In the present paper, some records of the morphological characters of the husked grains of wild rice were mainly described.

Materials and Methods

190 strains of *Oryza longistaminata* CHEV. et ROEHR., 49 strains of *Oryza breviligulata* CHEV. et ROEHR., 44 strains of *Oryza punctata* KOTSCHY, and 1 strain of *Oryza brachyantha* CHEV. et ROEHR., were used for morphological investigations of the husked grains.

Measurements were done for length, width and thickness of the 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.

In the present paper, the following abbreviations were adopted, *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), UHG (unhusked grain), HG (husked grain), s.d. (standard deviations).

Results and Discussion

The results were given in Tables 1 to 10, *i.e.*, *O. longistaminata*: Table 1—Madagascar, Accession Nos. 301–313 collected in 1985 and Nos. 2001–2047 collected in 1988, Table 2—Tanzania, No. 314 in 1984 and Nos. 2048–2083 in 1988, Table 3—Kenya, Nos. 315–324 in 1985, Table 4—Nigeria, Nos. 325–336 in 1984 and Nos. 337–382 in 1985, Table 5—Ivory Coast, Nos. 384–390 in 1984, Table 6—Senegal including Gambia, Nos. 391–441 in Casamance region and Nos. 444–455 in northern region, *O. breviligulata*: Table 7—Nigeria, Nos. 328–334 in 1984 and Nos. 344–380 in 1985, Table 5—Ivory Coast, No. 383 in 1984, Table 8—Senegal including Gambia, Nos. 398–442 in Casamance region and Nos. 443–456 in northern region, *O. punctata*: Table 9—Tanzania, Nos. 457–459 in 1984 and Nos. 2084–2109 in 1988, Table 10—Kenya, Nos. 460–464 in 1984 and Nos. 465–474 in 1985, *O. brachyantha*: Table 8—Senegal, No. 475 in 1985.

For summing-up the data, the results mentioned above were used, and were given in Table 11 for the practical value and in Table 12 for the standard deviations, but not given for the individual grain level. In these tables, 6 morphological characters of the husked grains were illustrated by the average values of the respective groups; *i.e.*, *O. longistaminata* in the first column --- **1**: Madagascar (**MD**) collected in 1985 (13 strains); **2**: the same, collected in 1988 (47 strains); **3**: the same, collected in the both years (60 strains); **4**: Tanzania (**TA**) collected in 1984 (1 strain); **5**: the same, collected in 1988 (36 strains); **6**: the same, collected in the both years (37 strains); **7**: Kenya (**KE**) collected in 1985 (10 strains); **8**: Nigeria (**NI**) collected in 1984 (5 strains); **9**: the same, collected in 1985 (29 strains); **10**: the same, collected in the both years (34 strains); **11**: Ivory Coast (**IV**) collected in 1984 (7 strains); **12**: Senegal (**SE**) collected in 1985 in Casamance region (35 strains); **13**: the same, in 1985 in northern region (7 strains); **14**: the same, of both the regions (42 strains); **15**: the summed up data of strains collected in 1984 and 1985 in the whole countries (107 strains); **16**: the summed up data of strains collected in 1984, 1985 and 1988 in the whole countries (190 strains); *O. breviligulata* in the second column --- **17**: Nigeria (**NI**) collected in 1984 (7 strains); **18**: the same, collected in 1985 (17 strains); **19**: the same, collected in the both years (24 strains); **20**: Ivory Coast (**IV**) collected in 1984 (1 strain); **21**: Senegal (**SE**) collected in 1985 in Casamance region (17 strains); **22**: the same, in northern region (7 strains); **23**: the same, of both the regions (24 strains); **24**: the summed up data of strains collected in 1984 and 1985 in three countries (49 strains); *O. punctata* in the third column --- **25**: Tanzania (**TA**) collected in 1984

(3 strains); **26**: the same, collected in 1988 (26 strains); **27**: the same, collected in the both years (29 strains); **28**: Kenya (KE) collected in 1984 (5 strains); **29**: the same, collected in 1985 (10 strains); **30**: the same, collected in the both years (15 strains); **31**: the summed up data of strains collected in 1984 and 1985 in two countries (18 strains); **32**: the summed up data of strains collected in 1984, 1985 and 1988 in two countries (44 strains); **33**: *O. brachyantha* in the fourth column --- Senegal (SE) collected in (1 strain).

Some strains have different meaning in view of physiological, meteorological and phylogenetical characters, and should be separately considered also in morphological studies. Accordingly, they are divided into two groups, and thereafter summed-up in the respective countries and groups, in view of the future analyses. **34**: East Africa of *O. longistaminata*; 107 strains in the total, *i.e.*, Madagascar (**1** [13 strains] and **2** [47 strains]), Tanzania (**4** [1 strain] and **5** [36 strains]) and Kenya (**7** [10 strains]), **35**: West Africa of *O. longistaminata*; 83 strains in the total, *i.e.*, Nigeria (**8** [5 strains] and **9** [29 strains]), Ivory Coast (**11** [7 strains]), Senegal (**12** [35 strains] and **13** [7 strains]).

I. *O. longistaminata* CHEV. et ROEHR.

1. Length

Lengths for the individual grain level ranged from 8.90 mm (strain No. 2044, collected in Madagascar in 1988) to 4.10 mm (No. 2005). In the strain level, the longest (8.26 mm) was obtained in No. 449, which was the same as in case of the unhusked grains (UHG), followed by Nos. 336 and 377 (7.33 mm). The shortest (4.88 mm) was noted in No. 303, which was also the same as in case of UHG, followed by Nos. 317 and 2005 (5.08 mm).

Table 1. Six morphological characters of husked grains collected in Madagascar, *O. longistaminata*, Nos. 301–313 in 1985 and Nos. 2001–2047 in 1988

Collection No.	Accession No.	Length (mm)	Width (mm)	Thickness (mm)	L/W	L/T	W/T
W1	301	6.65±0.12	1.93±0.02	1.37±0.02	3.44±0.03	4.87±0.12	1.42±0.02
W2	302	5.50±0.37	1.63±0.12	1.18±0.07	3.39±0.38	4.69±0.39	1.39±0.12
W3	303	4.88±0.25	1.58±0.13	1.12±0.05	3.10±0.30	4.36±0.30	1.41±0.11
W4	304	6.55±0.16	1.97±0.05	1.39±0.05	3.33±0.14	4.72±0.26	1.42±0.05
W5	305	6.59±0.18	1.99±0.11	1.31±0.04	3.32±0.12	5.03±0.15	1.52±0.06
W6	306	6.77±0.21	2.05±0.06	1.33±0.06	3.31±0.15	5.11±0.36	1.54±0.06
W7	307	6.40±0.31	2.14±0.07	1.65±0.08	3.00±0.14	3.88±0.16	1.30±0.07
W8	308	6.15±0.18	1.72±0.06	1.38±0.02	3.59±0.10	4.45±0.17	1.24±0.07
W9	309	6.08±0.25	1.79±0.08	1.31±0.06	3.41±0.23	4.65±0.19	1.37±0.12
W10	310	6.18±0.16	1.83±0.06	1.33±0.02	3.38±0.09	4.64±0.09	1.38±0.06
W11	311	6.35±0.25	1.83±0.13	1.28±0.02	3.49±0.29	4.96±0.23	1.43±0.09
W12	312	5.60±0.51	1.62±0.21	1.16±0.11	3.50±0.48	4.86±0.55	1.40±0.13
W13	313	5.88±0.05	1.73±0.05	1.27±0.06	3.40±0.11	4.66±0.23	1.37±0.04
Whole	Average	6.12±0.52	1.83±0.17	1.31±0.13	3.36±0.15	4.68±0.32	1.40±0.08
W1	2001	5.73±0.36	1.66±0.14	1.26±0.10	3.48±0.33	4.57±0.40	1.32±0.14
W2	2002	5.58±0.43	1.65±0.13	1.19±0.06	3.41±0.35	4.72±0.45	1.39±0.15
W3	2003	5.87±0.37	1.68±0.16	1.24±0.08	3.51±0.34	4.75±0.42	1.36±0.18

(Continued)

Table 1. (Continued)

Collection No.	Accession No.	Length (mm)	Width (mm)	Thickness (mm)	L/W	L/T	W/T
W4	2004	5.47±0.39	1.66±0.16	1.18±0.09	3.32±0.42	4.66±0.47	1.41±0.17
W5	2005	5.08±0.48	1.64±0.11	1.15±0.06	3.11±0.32	4.43±0.43	1.43±0.10
W6	2006	5.24±0.37	1.68±0.14	1.15±0.10	3.14±0.36	4.58±0.50	1.47±0.16
W7	2007	5.74±0.25	1.77±0.14	1.23±0.11	3.26±0.27	4.73±0.57	1.46±0.18
W8	2008	5.21±0.46	1.68±0.17	1.14±0.07	3.14±0.43	4.61±0.51	1.48±0.17
W9	2009	5.26±0.34	1.64±0.13	1.11±0.08	3.22±0.30	4.74±0.34	1.48±0.11
W10	2010	5.24±0.44	1.62±0.13	1.11±0.09	3.26±0.32	4.76±0.54	1.47±0.16
W11	2011	5.24±0.29	1.65±0.18	1.13±0.08	3.22±0.42	4.65±0.42	1.46±0.16
W12	2012	5.72±0.32	1.68±0.15	1.20±0.08	3.42±0.30	4.81±0.46	1.41±0.14
W13	2013	5.76±0.36	1.77±0.10	1.22±0.11	3.27±0.26	4.76±0.45	1.46±0.16
W14	2014	5.68±0.43	1.76±0.20	1.23±0.11	3.28±0.46	4.65±0.35	1.44±0.20
W15	2015	5.58±0.34	1.69±0.16	1.18±0.10	3.34±0.34	4.74±0.41	1.43±0.15
W16	2016	6.12±0.27	2.12±0.14	1.35±0.12	2.90±0.22	4.57±0.46	1.58±0.17
W17	2017	6.12±0.45	2.13±0.16	1.34±0.14	2.89±0.24	4.63±0.58	1.61±0.23
W18	2018	5.75±0.30	1.93±0.14	1.36±0.09	2.99±0.26	4.26±0.38	1.43±0.15
W19	2019	5.83±0.40	2.00±0.12	1.37±0.12	2.93±0.28	4.30±0.52	1.47±0.18
W20	2020	5.37±0.31	1.81±0.16	1.18±0.11	3.00±0.36	4.59±0.54	1.54±0.17
W21	2021	5.57±0.41	1.84±0.17	1.20±0.12	3.05±0.32	4.69±0.57	1.55±0.21
W22	2022	6.13±0.42	2.15±0.20	1.32±0.14	2.88±0.36	4.70±0.49	1.65±0.22
W23	2023	6.08±0.24	2.06±0.15	1.28±0.10	2.97±0.28	4.76±0.37	1.62±0.17
W24	2024	5.55±0.35	1.63±0.15	1.15±0.09	3.43±0.36	4.87±0.51	1.43±0.19
W25	2025	5.54±0.31	1.79±0.13	1.15±0.11	3.11±0.25	4.86±0.47	1.58±0.22
W26	2026	5.55±0.25	1.69±0.11	1.16±0.06	3.30±0.22	4.81±0.36	1.46±0.11
W27	2027	5.32±0.33	1.61±0.12	1.15±0.09	3.31±0.26	4.65±0.44	1.41±0.15
W28	2028	5.28±0.31	1.77±0.12	1.24±0.06	3.00±0.28	4.27±0.30	1.43±0.15
W29	2029	5.67±0.42	1.66±0.13	1.17±0.10	3.43±0.33	4.88±0.50	1.43±0.14
W30	2030	5.47±0.37	1.80±0.13	1.23±0.11	3.06±0.25	4.49±0.45	1.47±0.15
W31	2031	5.43±0.39	1.67±0.15	1.16±0.09	3.27±0.30	4.72±0.50	1.45±0.16
W32	2032	5.42±0.29	1.68±0.15	1.24±0.08	3.25±0.32	4.38±0.33	1.36±0.17
W33	2033	5.27±0.37	1.66±0.17	1.16±0.10	3.20±0.37	4.57±0.46	1.44±0.18
W34	2034	5.89±0.40	1.78±0.13	1.24±0.09	3.32±0.31	4.79±0.43	1.45±0.16
W35	2035	5.59±0.28	1.72±0.09	1.22±0.12	3.26±0.23	4.63±0.41	1.43±0.16
W36	2036	6.01±0.27	1.76±0.16	1.27±0.09	3.44±0.27	4.75±0.43	1.39±0.18
W37	2037	5.67±0.30	1.82±0.15	1.25±0.09	3.13±0.31	4.56±0.38	1.47±0.16
W38	2038	5.84±0.43	1.85±0.14	1.27±0.07	3.18±0.30	4.60±0.31	1.46±0.13
W39	2039	5.78±0.23	1.85±0.12	1.29±0.11	3.14±0.22	4.50±0.44	1.44±0.15
W40	2040	6.44±0.32	1.87±0.15	1.31±0.09	3.47±0.29	4.96±0.41	1.44±0.15
W41	2041	5.63±0.39	1.86±0.17	1.33±0.09	3.05±0.28	4.26±0.38	1.40±0.13
W42	2042	5.81±0.39	1.79±0.16	1.28±0.09	3.26±0.31	4.57±0.50	1.41±0.16
W43	2043	6.12±0.42	1.88±0.17	1.31±0.14	3.28±0.28	4.69±0.41	1.44±0.12
W44	2044	6.55±0.59	1.88±0.10	1.38±0.14	3.48±0.29	4.82±0.88	1.38±0.16
W45	2045	6.30±0.48	1.96±0.14	1.44±0.10	3.23±0.32	4.39±0.49	1.36±0.08
W46	2046	6.14±0.44	1.97±0.16	1.43±0.11	3.14±0.27	4.31±0.39	1.38±0.06
W47	2047	5.89±0.29	1.84±0.16	1.24±0.10	3.22±0.34	4.78±0.50	1.49±0.17
Whole	Average	5.69±0.34	1.79±0.14	1.24±0.08	3.21±0.17	4.63±0.17	1.45±0.07
Average of both groups		5.79±0.42	1.80±0.15	1.25±0.10	3.24±0.18	4.64±0.21	1.44±0.07

Table 2. Six morphological characters of husked grains collected in Tanzania, *O. longistaminata*, No. 314 in 1984 and Nos. 2048–2083 in 1988

Collection No.	Accession No.	Length (mm)	Width (mm)	Thickness (mm)	L/W	L/T	W/T
W14	314	6.68±0.38	2.03±0.05	1.53±0.10	3.30±0.13	4.37±0.23	1.33±0.08
W48	2048	7.14±0.38	1.78±0.11	1.42±0.08	4.04±0.27	5.06±0.32	1.26±0.09
W49	2049	6.36±0.55	1.77±0.17	1.22±0.11	3.62±0.43	5.26±0.70	1.46±0.19
W50	2050	6.48±0.40	1.81±0.13	1.41±0.11	3.59±0.29	4.65±0.53	1.30±0.12
W51	2051	6.88±0.49	2.14±0.34	1.46±0.20	3.28±0.43	4.78±0.58	1.47±0.13
W52	2052	6.55±0.58	1.91±0.19	1.43±0.10	3.47±0.47	4.58±0.38	1.34±0.14
W53	2053	5.89±0.31	2.06±0.14	1.38±0.09	2.87±0.26	4.27±0.26	1.50±0.13
W54	2054	6.51±0.35	1.85±0.16	1.27±0.10	3.56±0.43	5.18±0.42	1.47±0.21
W55	2055	6.02±0.52	1.81±0.10	1.30±0.07	3.33±0.29	4.68±0.64	1.41±0.13
W56	2056	5.51±0.77	1.70±0.28	1.26±0.12	3.30±0.52	4.41±0.67	1.35±0.21
W57	2057	6.50±0.57	1.96±0.24	1.43±0.08	3.36±0.42	4.57±0.44	1.37±0.14
W58	2058	6.51±0.55	1.89±0.12	1.34±0.10	3.47±0.43	4.88±0.53	1.42±0.16
W59	2059	6.30±0.56	2.03±0.18	1.38±0.13	3.13±0.37	4.58±0.52	1.47±0.15
W60	2060	6.08±0.41	1.86±0.16	1.35±0.09	3.29±0.37	4.52±0.44	1.38±0.10
W61	2061	6.32±0.43	1.94±0.19	1.31±0.11	3.31±0.47	4.85±0.43	1.49±0.21
W62	2062	5.99±0.51	1.92±0.19	1.29±0.13	3.16±0.42	4.71±0.72	1.52±0.31
W63	2063	6.41±0.41	1.84±0.11	1.32±0.12	3.50±0.25	4.89±0.38	1.40±0.15
W64	2064	6.12±0.44	1.79±0.14	1.31±0.11	3.43±0.33	4.71±0.42	1.38±0.16
W65	2065	5.99±0.27	1.81±0.12	1.31±0.10	3.32±0.25	4.61±0.38	1.39±0.10
W66	2066	5.44±0.33	1.76±0.14	1.27±0.11	3.12±0.11	4.32±0.44	1.39±0.15
W67	2067	6.84±0.39	1.81±0.10	1.39±0.08	3.80±0.30	4.95±0.36	1.31±0.10
W68	2068	6.05±0.45	1.69±0.11	1.29±0.10	3.59±0.36	4.73±0.42	1.32±0.09
W69	2069	6.29±0.62	1.96±0.17	1.25±0.15	3.23±0.40	5.06±0.60	1.58±0.18
W70	2070	6.51±0.51	1.79±0.18	1.33±0.12	3.69±0.55	4.93±0.50	1.36±0.17
W71	2071	6.02±0.39	1.72±0.17	1.22±0.11	3.54±0.39	4.98±0.51	1.42±0.16
W72	2072	6.53±0.30	1.77±0.18	1.34±0.08	3.72±0.40	4.89±0.35	1.32±0.13
W73	2073	5.70±0.64	2.08±0.26	1.22±0.13	2.79±0.51	4.74±0.82	1.71±0.17
W74	2074	6.24±0.44	1.77±0.14	1.32±0.09	3.55±0.36	4.75±0.46	1.34±0.12
W75	2075	6.31±0.43	1.76±0.18	1.31±0.09	3.62±0.42	4.82±0.42	1.34±0.15
W76	2076	6.41±0.67	1.76±0.12	1.34±0.08	3.65±0.44	4.80±0.48	1.32±0.12
W77	2077	6.48±0.53	1.97±0.17	1.41±0.09	3.33±0.46	4.61±0.46	1.40±0.12
W78	2078	5.87±0.39	1.99±0.19	1.40±0.10	2.99±0.42	4.19±0.26	1.42±0.16
W79	2079	6.14±0.36	2.00±0.19	1.40±0.11	3.10±0.43	4.41±0.47	1.44±0.15
W80	2080	6.35±0.32	1.81±0.12	1.31±0.08	3.53±0.37	4.85±0.40	1.38±0.13
W81	2081	6.29±0.47	1.75±0.13	1.29±0.09	3.61±0.37	4.91±0.45	1.37±0.12
W82	2082	5.98±0.57	1.71±0.14	1.21±0.08	3.51±0.34	4.67±0.14	1.35±0.33
W83	2083	5.96±0.42	1.76±0.18	1.22±0.08	3.42±0.50	4.91±0.41	1.46±0.21
Whole	Average	6.25±0.35	1.85±0.12	1.33±0.07	3.41±0.26	4.74±0.24	1.41±0.09
Average of both groups		6.26±0.35	1.86±0.12	1.33±0.07	3.41±0.25	4.73±0.24	1.40±0.09

Table 3. Six morphological characters of husked grains collected in Kenya, *O. longistaminata*, Nos. 315–324 in 1985

Collection No.	Accession No.	Length (mm)	Width (mm)	Thickness (mm)	L/W	L/T	W/T
W15	315	5.78±0.33	1.93±0.14	1.24±0.12	3.01±0.27	4.71±0.55	1.57±0.16
W16	316	5.50±0.42	1.66±0.11	1.20±0.11	3.32±0.28	4.62±0.55	1.39±0.13
W17	317	5.08±0.41	1.67±0.11	1.17±0.09	3.06±0.30	4.37±0.33	1.44±0.12
W18	318	6.13±0.30	2.00±0.10	1.39±0.04	3.07±0.15	4.41±0.20	1.44±0.03
W19	319	5.75±0.33	1.74±0.11	1.24±0.07	3.32±0.32	4.64±0.35	1.40±0.13
W20	320	6.07±0.14	1.95±0.06	1.32±0.04	3.12±0.13	4.61±0.24	1.48±0.05
W21	321	6.30±0.19	2.09±0.13	1.36±0.04	3.02±0.16	4.64±0.23	1.54±0.09
W22	322	6.40±0.17	1.97±0.10	1.37±0.04	3.26±0.20	4.68±0.25	1.44±0.09
W23	323	6.39±0.15	2.02±0.11	1.41±0.06	3.17±0.21	4.54±0.25	1.43±0.06
W24	324	6.12±0.13	2.00±0.00	1.35±0.00	3.06±0.06	4.53±0.09	1.48±0.00
Whole	Average	5.95±0.40	1.90±0.15	1.40±0.26	3.14±0.11	4.58±0.11	1.46±0.06

Table 4. Six morphological characters of husked grains collected in Nigeria, *O. longistaminata*, Nos. 325–336 in 1984 and Nos. 337–382 in 1985

Collection No.	Accession No.	Length (mm)	Width (mm)	Thickness (mm)	L/W	L/T	W/T
W25	325	5.68±0.34	1.75±0.09	1.24±0.09	3.26±0.27	4.59±0.34	1.41±0.09
W26	326	5.93±0.18	2.02±0.08	1.47±0.07	2.94±0.12	4.04±0.17	1.38±0.08
W27	327	6.25±0.24	1.94±0.18	1.41±0.10	3.25±0.35	4.46±0.36	1.38±0.16
W35	335	7.15±0.51	2.43±0.16	1.62±0.12	2.95±0.25	4.42±0.35	1.51±0.10
W36	336	7.33±0.40	2.56±0.17	1.68±0.12	2.87±0.23	4.38±0.38	1.53±0.10
Whole	Average	6.47±0.66	2.14±0.31	1.48±0.16	3.05±0.17	4.38±0.18	1.44±0.07
W37	337	7.10±0.30	1.91±0.05	1.41±0.04	3.72±0.23	5.04±0.32	1.36±0.05
W38	338	5.90±0.31	1.73±0.09	1.28±0.08	3.41±0.11	4.61±0.10	1.35±0.03
W39	339	6.27±0.08	1.74±0.06	1.23±0.02	3.61±0.08	5.10±0.07	1.42±0.04
W40	340	5.96±0.07	1.75±0.03	1.45±0.07	3.41±0.08	4.12±0.22	1.21±0.07
W41	341	6.26±0.27	1.92±0.14	1.31±0.02	3.27±0.21	4.78±0.23	1.47±0.13
W42	342	6.13±0.14	1.83±0.05	1.45±0.06	3.35±0.07	4.24±0.24	1.27±0.08
W43	343	6.00±0.12	1.84±0.09	1.47±0.09	3.27±0.12	4.10±0.31	1.26±0.13
W45	345	6.18±0.59	1.97±0.08	1.44±0.02	3.14±0.33	4.29±0.40	1.37±0.07
W46	346	5.76±0.35	1.72±0.16	1.21±0.08	3.37±0.36	4.78±0.51	1.43±0.15
W48	348	6.68±0.60	2.03±0.09	1.45±0.05	3.30±0.34	4.60±0.30	1.40±0.09
W49	349	6.04±0.07	1.77±0.08	1.46±0.04	3.42±0.16	4.14±0.12	1.21±0.05
W52	352	5.42±0.29	1.80±0.12	1.22±0.09	3.03±0.21	4.46±0.26	1.48±0.14
W54	354	5.62±0.29	1.80±0.15	1.29±0.09	3.14±0.31	4.37±0.37	1.40±0.12
W55	355	5.78±0.34	2.01±0.07	1.46±0.06	2.88±0.20	3.97±0.29	1.38±0.03
W57	357	6.15±0.10	1.98±0.07	1.45±0.05	3.11±0.06	4.24±0.07	1.37±0.03
W58	358	6.20±0.11	1.80±0.06	1.50±0.03	3.45±0.10	4.13±0.07	1.20±0.04
W60	360	6.11±0.18	1.86±0.05	1.44±0.02	3.29±0.10	4.24±0.09	1.29±0.03
W62	362	6.28±0.21	1.92±0.19	1.35±0.05	3.30±0.30	4.66±0.23	1.42±0.13
W64	364	6.27±0.16	1.76±0.14	1.41±0.09	3.58±0.28	4.47±0.37	1.26±0.16
W65	365	6.69±0.49	1.89±0.09	1.42±0.05	3.55±0.34	4.72±0.44	1.33±0.06

(Continued)

Table 4. (Continued)

Collection No.	Accession No.	Length (mm)	Width (mm)	Thickness (mm)	L/W	L/T	W/T
W69	369	7.03±0.17	1.88±0.05	1.34±0.02	3.74±0.12	5.25±0.09	1.40±0.05
W71	371	5.45±0.44	1.83±0.14	1.27±0.07	3.01±0.37	4.32±0.46	1.44±0.13
W73	373	6.19±0.11	1.75±0.06	1.29±0.07	3.54±0.13	4.81±0.26	1.36±0.08
W75	375	7.21±0.29	1.79±0.07	1.32±0.06	4.04±0.25	5.47±0.31	1.36±0.05
W77	377	7.33±0.08	1.64±0.07	1.37±0.04	4.48±0.20	5.35±0.15	1.20±0.04
W78	378	6.83±0.26	1.78±0.02	1.33±0.10	3.84±0.16	5.15±0.28	1.35±0.09
W79	379	6.17±0.13	2.10±0.06	1.45±0.03	2.94±0.07	4.26±0.06	1.45±0.06
W81	381	7.08±0.16	1.83±0.05	1.41±0.02	3.87±0.17	5.02±0.13	1.30±0.03
W82	382	6.52±0.10	1.86±0.04	1.45±0.05	3.51±0.06	4.50±0.16	1.29±0.06
Whole	Average	6.30±0.51	1.84±0.10	1.38±0.08	3.43±0.34	4.59±0.41	1.35±0.08
Average of both groups		6.32±0.53	1.89±0.18	1.39±0.11	3.41±0.35	4.56±0.39	1.36±0.09

Table 5. Six morphological characters of husked grains collected in Ivory Coast in 1984, *O. longistaminata* (Nos. 384–390) and *O. breviligulata* (No. 383)

Collection No.	Accession No.	Length (mm)	Width (mm)	Thickness (mm)	L/W	L/T	W/T
W84	384	5.36±0.43	1.76±0.19	1.22±0.10	3.18±0.36	4.42±0.36	1.40±0.13
W85	385	5.35±0.43	1.83±0.12	1.31±0.10	2.94±0.27	4.09±0.34	1.40±0.12
W86	386	5.38±0.23	1.82±0.13	1.28±0.11	2.97±0.26	4.23±0.44	1.43±0.14
W87	387	6.64±0.48	1.81±0.17	1.34±0.08	3.70±0.47	4.98±0.35	1.36±0.16
W88	388	5.90±0.38	1.83±0.14	1.33±0.12	3.25±0.33	4.47±0.45	1.38±0.14
W89	389	5.87±0.45	2.00±0.20	1.37±0.10	2.98±0.40	4.31±0.48	1.46±0.14
W90	390	6.03±0.37	1.92±0.16	1.39±0.10	3.17±0.35	4.37±0.35	1.39±0.15
Whole	Average	5.79±0.44	1.85±0.07	1.32±0.05	3.17±0.24	4.41±0.26	1.40±0.03
W83	383	7.73±0.20	2.30±0.06	1.46±0.06	3.37±0.11	5.32±0.18	1.58±0.08

Table 6. Six morphological characters of husked grains collected in Senegal in 1985, *O. longistaminata*, Nos. 391–441 in Casamance region and Nos. 444–455 in northern region

Collection No.	Accession No.	Length (mm)	Width (mm)	Thickness (mm)	L/W	L/T	W/T
W91	391	6.48±0.28	1.82±0.09	1.33±0.05	3.57±0.20	4.87±0.13	1.37±0.10
W92	392	6.75±0.20	1.80±0.03	1.42±0.06	3.75±0.17	4.76±0.28	1.27±0.06
W93	393	6.64±0.14	1.74±0.06	1.40±0.10	3.82±0.20	4.76±0.23	1.25±0.11
W94	394	5.66±0.29	1.94±0.07	1.32±0.05	2.92±0.19	4.30±0.34	1.47±0.10
W95	395	6.26±0.35	1.86±0.10	1.25±0.08	3.38±0.37	5.03±0.45	1.50±0.14
W96	396	6.48±0.37	1.84±0.06	1.26±0.04	3.53±0.24	5.15±0.29	1.46±0.05
W97	397	6.29±0.17	1.70±0.03	1.28±0.05	3.70±0.08	4.92±0.17	1.33±0.04
W99	399	5.78±0.41	1.76±0.17	1.22±0.10	3.31±0.32	4.76±0.42	1.45±0.15
W100	400	6.71±0.22	1.88±0.02	1.37±0.02	3.57±0.12	4.90±0.13	1.37±0.02

(Continued)

Table 6. (Continued)

Collection No.	Accession No.	Length (mm)	Width (mm)	Thickness (mm)	L/W	L/T	W/T
W101	401	5.98±0.46	1.95±0.15	1.32±0.10	3.09±0.33	4.53±0.36	1.48±0.18
W102	402	6.60±0.11	1.86±0.06	1.34±0.04	3.55±0.14	4.93±0.20	1.39±0.06
W106	406	6.26±0.23	1.87±0.08	1.36±0.04	3.36±0.22	4.61±0.24	1.38±0.06
W107	407	6.64±0.18	1.94±0.04	1.32±0.04	3.42±0.06	5.03±0.15	1.47±0.03
W108	408	6.52±0.27	1.78±0.12	1.29±0.05	3.67±0.21	5.06±0.17	1.38±0.09
W109	409	7.00±0.15	1.81±0.08	1.37±0.05	3.87±0.14	5.12±0.20	1.32±0.09
W111	411	6.77±0.20	1.82±0.07	1.36±0.04	3.72±0.16	4.98±0.19	1.34±0.02
W112	412	6.71±0.26	1.66±0.04	1.32±0.02	4.05±0.19	5.09±0.29	1.26±0.03
W114	414	6.77±0.05	2.03±0.05	1.40±0.00	3.34±0.07	4.84±0.04	1.45±0.04
W116	416	5.84±0.22	1.58±0.16	0.82±0.04	3.74±0.43	7.13±0.28	1.93±0.24
W119	419	6.66±0.17	1.83±0.08	1.30±0.08	3.65±0.16	5.14±0.33	1.41±0.08
W120	420	6.70±0.26	1.70±0.14	1.32±0.05	3.98±0.42	5.08±0.29	1.29±0.11
W123	423	6.45±0.17	1.85±0.06	1.39±0.07	3.49±0.08	4.65±0.13	1.33±0.06
W124	424	6.61±0.09	1.87±0.04	1.35±0.08	3.54±0.10	4.92±0.33	1.39±0.11
W126	426	5.48±0.20	1.48±0.19	0.97±0.20	3.77±0.58	5.94±0.27	1.56±0.14
W127	427	7.09±0.29	2.26±0.06	1.48±0.06	3.14±0.15	4.79±0.23	1.53±0.08
W129	429	7.04±0.17	2.29±0.06	1.55±0.06	3.07±0.11	4.57±0.24	1.49±0.07
W131	431	6.57±0.33	1.91±0.09	1.38±0.08	3.45±0.23	4.77±0.25	1.39±0.09
W133	433	6.22±0.19	1.82±0.08	1.28±0.07	3.43±0.21	4.87±0.13	1.43±0.11
W134	434	6.36±0.24	1.85±0.07	1.34±0.06	3.44±0.21	4.76±0.36	1.38±0.03
W135	435	6.25±0.16	1.69±0.15	1.30±0.06	3.73±0.33	4.82±0.24	1.31±0.15
W136	436	6.51±0.15	1.69±0.14	1.26±0.02	3.88±0.29	5.17±0.15	1.34±0.10
W137	437	6.17±0.18	1.75±0.06	1.26±0.07	3.53±0.11	4.91±0.16	1.39±0.07
W139	439	6.18±0.16	1.80±0.10	1.25±0.06	3.44±0.14	4.96±0.28	1.44±0.09
W140	440	6.88±0.17	1.53±0.06	1.33±0.02	4.49±0.09	5.16±0.14	1.15±0.05
W141	441	5.86±0.45	1.80±0.10	1.23±0.04	3.27±0.36	4.77±0.34	1.47±0.11
Whole	Average	6.43±0.39	1.82±0.16	1.31±0.12	3.56±0.30	4.97±0.45	1.41±0.12
W144	444	6.95±0.24	1.87±0.05	1.32±0.09	3.72±0.12	5.29±0.38	1.42±0.07
W147	447	6.15±0.16	1.73±0.11	1.23±0.05	3.57±0.28	5.01±0.21	1.41±0.09
W149	449	8.26±0.21	2.42±0.10	1.56±0.13	3.42±0.14	5.33±0.55	1.56±0.16
W151	451	6.28±0.52	1.84±0.06	1.35±0.03	3.42±0.32	4.65±0.40	1.36±0.05
W152	452	6.90±0.09	2.08±0.02	1.45±0.03	3.32±0.07	4.76±0.14	1.44±0.04
W154	454	6.83±0.13	1.98±0.09	1.41±0.04	3.46±0.16	4.85±0.08	1.41±0.08
W155	455	6.70±0.11	1.98±0.08	1.43±0.09	3.39±0.12	4.71±0.35	1.39±0.13
Whole	Average	6.87±0.64	1.99±0.21	1.39±0.10	3.47±0.12	4.94±0.26	1.43±0.06
Average of both groups		6.51±0.47	1.85±0.18	1.32±0.12	3.55±0.28	4.97±0.43	1.41±0.12

Table 7. Six morphological characters of husked grains collected in Nigeria, *O. breviligulata*, Nos. 328–334 in 1984 and Nos. 344–380 in 1985

Collection No.	Accession No.	Length (mm)	Width (mm)	Thickness (mm)	L/W	L/T	W/T
W28	328	6.86±0.31	2.80±0.17	1.99±0.12	2.46±0.12	3.45±0.25	1.41±0.13
W29	329	6.68±0.54	2.60±0.13	1.81±0.07	2.57±0.19	3.69±0.31	1.44±0.10
W30	330	6.49±0.25	2.74±0.07	1.89±0.06	2.37±0.10	3.44±0.15	1.45±0.06
W31	331	6.90±0.31	2.51±0.10	1.83±0.05	2.76±0.12	3.77±0.19	1.37±0.05
W32	332	7.53±0.20	2.57±0.09	1.65±0.10	2.93±0.11	4.58±0.26	1.56±0.09
W33	333	8.06±0.18	2.70±0.11	1.83±0.08	2.99±0.13	4.41±0.20	1.48±0.11
W34	334	8.22±0.18	2.26±0.09	1.62±0.06	3.64±0.14	5.07±0.24	1.40±0.09
Whole	Average	7.25±0.64	2.60±0.17	1.80±0.12	2.82±0.40	4.06±0.58	1.44±0.06
W44	344	6.74±0.16	2.94±0.11	1.70±0.08	2.30±0.11	3.97±0.20	1.73±0.09
W47	347	6.28±0.16	2.70±0.09	1.72±0.08	2.33±0.07	3.67±0.20	1.58±0.09
W50	350	7.92±0.35	2.29±0.09	1.64±0.06	3.47±0.25	4.82±0.17	1.40±0.09
W51	351	6.04±0.14	2.57±0.12	1.53±0.10	2.35±0.12	3.97±0.24	1.69±0.11
W53	353	6.20±0.22	2.69±0.14	1.71±0.07	2.31±0.10	3.63±0.21	1.57±0.13
W56	356	6.69±0.20	2.89±0.10	1.68±0.09	2.32±0.10	3.99±0.22	1.72±0.13
W59	359	6.99±0.19	2.59±0.10	1.65±0.07	2.70±0.09	4.26±0.25	1.58±0.11
W61	361	6.68±0.21	2.88±0.11	1.72±0.10	2.33±0.11	3.90±0.19	1.68±0.12
W63	363	7.26±0.22	2.71±0.12	1.62±0.11	2.68±0.16	4.51±0.32	1.69±0.12
W66	366	7.60±0.14	2.78±0.09	1.68±0.09	2.74±0.10	4.54±0.25	1.66±0.09
W67	367	6.77±0.27	2.14±0.14	1.39±0.10	3.18±0.18	4.89±0.30	1.54±0.11
W68	368	6.71±0.25	2.29±0.10	1.39±0.06	2.94±0.12	4.83±0.19	1.65±0.09
W70	370	7.34±0.18	2.28±0.08	1.57±0.04	3.23±0.14	4.67±0.15	1.45±0.07
W72	372	6.49±0.18	2.43±0.14	1.61±0.06	2.68±0.20	4.03±0.16	1.51±0.08
W74	374	6.81±0.29	2.71±0.12	1.73±0.09	2.51±0.13	3.96±0.24	1.58±0.12
W76	376	6.62±0.32	2.69±0.15	1.73±0.07	2.47±0.20	3.84±0.22	1.56±0.10
W80	380	6.49±0.22	3.00±0.15	1.86±0.10	2.17±0.13	3.51±0.18	1.62±0.11
Whole	Average	6.80±0.48	2.62±0.25	1.63±0.13	2.63±0.37	4.18±0.44	1.60±0.09
Average of both groups		6.93±0.57	2.62±0.23	1.68±0.15	2.69±0.39	4.14±0.49	1.56±0.11

Table 8. Six morphological characters of husked grains collected in Senegal in 1985, *O. breviligulata*, Nos. 398–442 in Casamance region and Nos. 443–456 in northern region; *O. brachyantha*, No. 475

Collection No.	Accession No.	Length (mm)	Width (mm)	Thickness (mm)	L/W	L/T	W/T
W98	398	6.79±0.15	2.24±0.02	1.63±0.08	3.03±0.08	4.18±0.23	1.38±0.07
W103	403	5.78±0.26	2.60±0.10	1.68±0.09	2.22±0.13	3.44±0.21	1.55±0.11
W104	404	6.90±0.21	2.57±0.08	1.60±0.09	2.69±0.13	4.32±0.21	1.61±0.11
W105	405	5.70±0.21	2.57±0.12	1.62±0.07	2.22±0.10	3.53±0.17	1.59±0.10
W110	410	7.20±0.19	2.47±0.05	1.47±0.06	2.92±0.05	4.90±0.19	1.68±0.07
W113	413	7.14±0.23	2.55±0.07	1.68±0.02	2.80±0.04	4.25±0.15	1.52±0.05
W115	415	6.89±0.20	2.59±0.05	1.66±0.05	2.66±0.08	4.16±0.17	1.56±0.07
W117	417	6.10±0.16	2.69±0.04	1.73±0.08	2.27±0.08	3.53±0.17	1.56±0.08
W118	418	7.42±0.16	2.38±0.12	1.59±0.08	3.12±0.15	4.69±0.26	1.50±0.10
W121	421	6.04±0.25	2.68±0.11	1.70±0.08	2.25±0.10	3.55±0.19	1.58±0.06
W122	422	7.68±0.05	2.04±0.06	1.51±0.04	3.77±0.12	5.09±0.11	1.35±0.07
W125	425	7.38±0.16	2.50±0.08	1.54±0.07	2.96±0.09	4.82±0.25	1.63±0.09
W128	428	6.38±0.22	1.52±0.15	0.89±0.12	4.23±0.40	7.32±0.14	1.72±0.14
W130	430	6.31±0.28	2.36±0.17	1.56±0.06	2.68±0.14	4.05±0.12	1.51±0.08
W132	432	6.55±0.24	2.42±0.12	1.56±0.10	2.72±0.15	4.20±0.25	1.55±0.14
W138	438	6.93±0.05	2.26±0.06	1.47±0.02	3.07±0.09	4.72±0.10	1.54±0.06
W142	442	6.68±0.30	2.25±0.10	1.37±0.09	2.97±0.14	4.90±0.28	1.65±0.11
Whole	Average	6.70±0.57	2.39±0.28	1.55±0.19	2.86±0.52	4.45±0.88	1.56±0.09
W143	443	6.06±0.16	2.68±0.09	1.70±0.07	2.26±0.09	3.56±0.17	1.58±0.07
W145	445	6.11±0.17	2.73±0.09	1.69±0.05	2.24±0.09	3.63±0.14	1.62±0.08
W146	446	5.91±0.16	2.81±0.12	1.78±0.10	2.11±0.12	3.32±0.18	1.58±0.12
W148	448	6.00±0.14	2.55±0.12	1.75±0.10	2.36±0.13	3.43±0.23	1.46±0.09
W150	450	7.91±0.19	2.46±0.14	1.67±0.05	3.23±0.21	4.74±0.16	1.48±0.12
W153	453	6.13±0.19	2.62±0.09	1.64±0.06	2.34±0.12	3.74±0.17	1.60±0.08
W156	456	6.14±0.21	2.55±0.14	1.62±0.12	2.42±0.14	3.82±0.34	1.58±0.13
Whole	Average	6.32±0.65	2.63±0.11	1.69±0.05	2.42±0.34	3.71±0.35	1.56±0.06
Average of both groups		6.59±0.62	2.46±0.26	1.59±0.17	2.73±0.51	4.25±0.84	1.56±0.08
W175	475	6.95±0.31	1.59±0.09	1.26±0.13	4.39±0.28	5.57±0.52	1.27±0.14

Table 9. Six morphological characters of husked grains collected in Tanzania, *O. punctata*, Nos. 457–459 in 1984 and Nos. 2084–2109 in 1988

Collection No.	Accession No.	Length (mm)	Width (mm)	Thickness (mm)	L/W	L/T	W/T
W157	457	4.85±0.15	2.03±0.08	1.36±0.07	2.40±0.11	3.57±0.18	1.49±0.08
W158	458	4.51±0.14	2.05±0.09	1.35±0.10	2.20±0.09	3.35±0.26	1.53±0.05
W159	459	4.72±0.19	2.07±0.11	1.32±0.06	2.30±0.18	3.60±0.18	1.57±0.11
Whole	Average	4.69±0.14	2.05±0.02	1.34±0.02	2.30±0.08	3.51±0.11	1.53±0.03
W84	2084	4.40±0.33	1.87±0.19	1.21±0.07	2.37±0.26	3.36±0.34	1.56±0.20
W85	2085	4.69±0.25	2.11±0.14	1.33±0.10	2.24±0.23	3.55±0.22	1.60±0.16
W86	2086	4.43±0.29	1.78±0.20	1.20±0.09	2.52±0.28	3.72±0.35	1.49±0.13
W87	2087	4.60±0.27	1.96±0.14	1.33±0.07	2.36±0.19	3.47±0.26	1.47±0.10
W88	2088	4.59±0.30	2.04±0.17	1.32±0.09	2.27±0.23	3.50±0.28	1.55±0.13
W89	2089	4.24±0.37	1.68±0.20	1.21±0.08	2.56±0.32	3.54±0.41	1.39±0.17
W90	2090	4.15±0.30	1.74±0.19	1.19±0.08	2.42±0.35	3.51±0.40	1.47±0.16
W91	2091	4.64±0.38	1.82±0.20	1.22±0.09	2.59±0.35	3.83±0.46	1.49±0.16
W92	2092	4.43±0.37	1.81±0.17	1.17±0.08	2.46±0.31	3.80±0.46	1.55±0.15
W93	2093	4.61±0.29	1.84±0.16	1.19±0.08	2.52±0.27	3.89±0.41	1.56±0.17
W94	2094	4.59±0.45	1.79±0.16	1.18±0.10	2.58±0.35	3.91±0.48	1.53±0.19
W95	2095	4.54±0.22	1.90±0.15	1.30±0.08	2.41±0.23	3.50±0.27	1.46±0.11
W96	2096	4.28±0.25	1.94±0.20	1.27±0.07	2.23±0.27	3.37±0.21	1.53±0.19
W97	2097	4.07±0.25	1.83±0.15	1.21±0.07	2.24±0.26	3.39±0.32	1.52±0.16
W98	2098	4.25±0.28	2.06±0.19	1.34±0.07	2.08±0.20	3.18±0.28	1.54±0.14
W99	2099	4.07±0.29	1.98±0.16	1.30±0.07	2.07±0.22	3.13±0.23	1.52±0.14
W100	2100	4.26±0.28	1.94±0.20	1.25±0.03	2.23±0.30	3.42±0.22	1.56±0.18
W101	2101	4.42±0.23	1.98±0.15	1.24±0.06	2.25±0.20	3.56±0.21	1.59±0.12
W102	2102	4.63±0.33	1.94±0.13	1.17±0.08	2.40±0.19	3.99±0.37	1.67±0.16
W103	2103	4.36±0.25	1.97±0.16	1.22±0.06	2.23±0.21	3.59±0.24	1.62±0.12
W104	2104	4.34±0.23	1.95±0.15	1.21±0.04	2.25±0.25	3.60±0.24	1.61±0.12
W105	2105	4.23±0.25	1.76±0.14	1.18±0.07	2.42±0.24	3.60±0.32	1.50±0.15
W106	2106	4.24±0.25	1.86±0.16	1.24±0.08	2.29±0.23	3.42±0.26	1.50±0.15
W107	2107	4.43±0.29	1.87±0.17	1.31±0.07	2.39±0.25	3.37±0.20	1.43±0.14
W108	2108	4.31±0.24	1.79±0.18	1.19±0.07	2.44±0.32	3.65±0.27	1.51±0.19
W109	2109	4.33±0.28	1.87±0.21	1.21±0.05	2.35±0.31	3.60±0.31	1.55±0.17
Whole	Average	4.39±0.18	1.89±0.10	1.24±0.05	2.35±0.14	3.57±0.20	1.53±0.06
Average of both groups		4.42±0.20	1.90±0.11	1.25±0.06	2.35±0.14	3.56±0.20	1.53±0.06

Table 10. Six morphological characters of husked grains collected in Kenya, *O. punctata*, Nos. 460–464 in 1984 and Nos. 465–474 in 1985

Collection No.	Accession No.	Length (mm)	Width (mm)	Thickness (mm)	L/W	L/T	W/T
W160	460	4.51±0.24	1.86±0.11	1.21±0.12	2.43±0.23	3.76±0.36	1.56±0.20
W161	461	4.21±0.18	1.97±0.08	1.10±0.08	2.14±0.14	3.84±0.25	1.80±0.16
W162	462	4.72±0.26	1.96±0.08	1.21±0.09	2.41±0.15	3.92±0.32	1.63±0.10
W163	463	5.11±0.25	2.01±0.09	1.37±0.08	2.55±0.18	3.75±0.31	1.47±0.08
W164	464	4.83±0.24	1.97±0.10	1.34±0.10	2.46±0.16	3.60±0.23	1.47±0.13
Whole	Average	4.68±0.30	1.95±0.05	1.25±0.10	2.40±0.14	3.77±0.11	1.59±0.12
W165	465	4.86±0.34	1.80±0.11	1.23±0.08	2.70±0.23	3.96±0.35	1.47±0.10
W166	466	4.48±0.17	2.00±0.11	1.31±0.09	2.24±0.14	3.44±0.27	1.54±0.15
W167	467	4.64±0.24	1.93±0.06	1.13±0.10	2.40±0.13	4.14±0.37	1.73±0.14
W168	468	4.12±0.18	1.93±0.17	1.15±0.09	2.15±0.19	3.62±0.28	1.69±0.16
W169	469	4.10±0.17	1.86±0.14	1.06±0.11	2.23±0.22	3.92±0.48	1.78±0.25
W170	470	4.03±0.19	1.98±0.16	1.33±0.07	2.04±0.18	3.03±0.22	1.49±0.15
W171	471	4.11±0.36	2.02±0.06	1.33±0.10	2.03±0.17	3.11±0.35	1.53±0.13
W172	472	4.49±0.33	1.88±0.08	1.17±0.09	2.39±0.22	3.84±0.37	1.62±0.14
W173	473	5.08±0.14	2.03±0.13	1.20±0.09	2.51±0.18	4.26±0.31	1.71±0.21
W174	474	5.08±0.10	1.90±0.08	1.24±0.04	2.68±0.11	4.11±0.22	1.54±0.09
Whole	Average	4.50±0.39	1.93±0.07	1.22±0.09	2.34±0.23	3.74±0.41	1.61±0.11
Average of both groups		4.56±0.37	1.94±0.07	1.23±0.09	2.36±0.21	3.75±0.34	1.60±0.11

In the group level (Table 11), the longest (6.87 mm) was obtained in the strains collected in northern region of Senegal in 1985 [illustrated as mark **13** in Table 11], which was also the same as in case of UHG, followed by group **4** [Tanzania in 1984] (6.68 mm) and group **8** [Nigeria in 1984] (6.47 mm). These orders of groups (**13**>**4**>**8**) were found to be the same as in case of UHG. The shortest (5.69 mm) was noted in group **2** [Madagascar in 1988], followed by group **3** [Madagascar in 1985 and 1988] and **11** [Ivory Coast in 1984] (5.79 mm). These combinations of groups (**2**, **3** and **11**) were found to be the same as in case of UHG. Averages and those standard deviations (s.d.) through the whole strains belonging to the group **34** (summed-up of groups **1**, **2**, **4**, **5** and **7**, *i.e.*, East Africa) and group **35** (summed-up of groups **8**, **9**, **11**, **12** and **13**, *i.e.*, West Africa) were found to be 5.97 ± 0.46 and 6.37 ± 0.53 , respectively.

In the s.d. of each strain, *i.e.*, in those showing intra-population's variations, the largest (0.67) was obtained in No. 2076, followed by No. 2073 (0.64) and No. 2069 (0.62). The smallest (0.05) was noted in Nos. 313 and 414, followed by Nos. 340 and 349 (0.07). In group level, the largest (0.66) was obtained in group **8**, followed by group **13** (0.64) and group **15** (0.54), in which groups **8** and **13** were the same as in case of UHG. The smallest (0.34) was noted in group **2**, followed by groups **5** and **6** (0.35).

The s.d. of the husked grains illustrated by average values of the respective groups were shown in Table 12. The largest (0.47) was obtained in group **5**, followed by group **6** (0.46) and group **11** (0.40), in which the last one was the same as in case of UHG. The smallest (0.21) was noted in group **13**, followed by group **14** (0.22), and groups **1**, **9** and **12** (0.23). Averages and those s.d. in the whole strains belonging to the groups **34** and **35** were found to be 0.37 ± 0.13 and 0.25 ± 0.13 , respectively.

Table 11. Six morphological characters of husked grains illustrated by average values of the respective groups. Country and group marks were noted in the text.

Country	Group mark	Length (mm)	Width (mm)	Thickness (mm)	L/W	L/T	W/T
MD	1	6.12±0.52	1.83±0.17	1.31±0.13	3.36±0.15	4.68±0.32	1.40±0.08
	2	5.69±0.34	1.79±0.14	1.24±0.08	3.21±0.17	4.63±0.17	1.45±0.07
	3	5.79±0.42	1.80±0.15	1.25±0.10	3.24±0.18	4.64±0.21	1.44±0.07
TA	4	6.68±0.38	2.03±0.05	1.53±0.10	3.30±0.13	4.37±0.23	1.33±0.08
	5	6.25±0.35	1.85±0.12	1.33±0.07	3.41±0.26	4.74±0.24	1.41±0.09
	6	6.26±0.35	1.86±0.12	1.33±0.07	3.41±0.25	4.73±0.24	1.40±0.09
KE	7	5.95±0.40	1.90±0.15	1.40±0.26	3.14±0.11	4.58±0.11	1.46±0.06
NI	8	6.47±0.66	2.14±0.31	1.48±0.16	3.05±0.17	4.38±0.18	1.44±0.07
	9	6.30±0.51	1.84±0.10	1.38±0.08	3.43±0.34	4.59±0.41	1.35±0.08
	10	6.32±0.53	1.89±0.18	1.39±0.11	3.41±0.35	4.56±0.39	1.36±0.09
IV	11	5.79±0.44	1.85±0.07	1.32±0.05	3.17±0.24	4.41±0.26	1.40±0.03
SE	12	6.43±0.39	1.82±0.16	1.31±0.12	3.56±0.30	4.97±0.45	1.41±0.12
	13	6.87±0.64	1.99±0.21	1.39±0.10	3.47±0.12	4.94±0.26	1.43±0.06
	14	6.51±0.47	1.85±0.18	1.32±0.12	3.55±0.28	4.97±0.43	1.41±0.12
SUM	15	6.30±0.54	1.87±0.17	1.34±0.12	3.41±0.31	4.72±0.42	1.40±0.10
	16	6.14±0.53	1.84±0.16	1.31±0.11	3.36±0.28	4.71±0.35	1.41±0.09
NI	17	7.25±0.64	2.60±0.17	1.80±0.12	2.82±0.40	4.06±0.58	1.44±0.06
	18	6.80±0.48	2.62±0.25	1.63±0.13	2.63±0.37	4.18±0.44	1.60±0.09
	19	6.93±0.57	2.62±0.23	1.68±0.15	2.69±0.39	4.14±0.49	1.56±0.11
IV	20	7.73±0.20	2.30±0.06	1.46±0.06	3.37±0.11	5.32±0.18	1.58±0.08
SE	21	6.70±0.57	2.39±0.28	1.55±0.19	2.86±0.52	4.45±0.88	1.56±0.09
	22	6.32±0.65	2.63±0.11	1.69±0.05	2.42±0.34	3.71±0.35	1.56±0.06
	23	6.59±0.62	2.46±0.26	1.59±0.17	2.73±0.51	4.25±0.84	1.56±0.08
SUM	24	6.78±0.63	2.53±0.26	1.64±0.17	2.73±0.46	4.22±0.70	1.56±0.10
TA	25	4.69±0.14	2.05±0.02	1.34±0.02	2.30±0.08	3.51±0.11	1.53±0.03
	26	4.39±0.18	1.89±0.10	1.24±0.05	2.35±0.14	3.57±0.20	1.53±0.06
	27	4.42±0.20	1.90±0.11	1.25±0.06	2.35±0.14	3.56±0.20	1.53±0.06
KE	28	4.68±0.30	1.95±0.05	1.25±0.10	2.40±0.14	3.77±0.11	1.59±0.12
	29	4.50±0.39	1.93±0.07	1.22±0.09	2.34±0.23	3.74±0.41	1.61±0.11
	30	4.56±0.37	1.94±0.07	1.23±0.09	2.36±0.21	3.75±0.34	1.60±0.11
SUM	31	4.58±0.35	1.96±0.07	1.25±0.10	2.35±0.19	3.71±0.33	1.59±0.11
	32	4.47±0.28	1.92±0.10	1.24±0.07	2.35±0.16	3.63±0.27	1.55±0.09
SE	33	6.95±0.31	1.59±0.09	1.26±0.13	4.39±0.28	5.57±0.52	1.27±0.14

2. Width

Widths for the individual grain level ranged from 2.90 mm (Nos. 336 and 2051, in which No. 336 was the same as in cases of L of UHG and HG) to 1.20 mm (Nos. 312 and 2033). In the strain level, the widest (2.56 mm) was obtained in No. 336, followed by No. 335 (2.43 mm) and No. 449 (2.42 mm). These orders of strains (336>335>449) were found to be the same as in cases of L and W of UHG. The narrowest (1.48 mm) was noted in No. 426, followed by No. 440 (1.53 mm), and Nos. 303 and 416 (1.58 mm).

Table 12. Standard deviations of husked grains illustrated by average values of the respective groups. Country and group marks were noted in the text.

Country	Group mark	Length (mm)	Width (mm)	Thickness (mm)	L/W	L/T	W/T
MD	1	0.23±0.11	0.09±0.05	0.05±0.03	0.23±0.12	0.25±0.12	0.08±0.03
	2	0.36±0.07	0.15±0.02	0.10±0.02	0.31±0.06	0.45±0.09	0.16±0.03
	3	0.33±0.10	0.13±0.04	0.09±0.03	0.28±0.09	0.41±0.14	0.14±0.05
TA	4	0.38±0.00	0.05±0.00	0.10±0.00	0.13±0.00	0.23±0.00	0.08±0.00
	5	0.47±0.11	0.17±0.05	0.10±0.02	0.39±0.08	0.46±0.13	0.16±0.05
	6	0.46±0.11	0.16±0.05	0.10±0.02	0.38±0.09	0.46±0.14	0.15±0.05
KE	7	0.26±0.11	0.10±0.04	0.06±0.04	0.21±0.08	0.30±0.14	0.09±0.05
NI	8	0.33±0.12	0.14±0.04	0.10±0.02	0.24±0.07	0.32±0.08	0.11±0.03
	9	0.23±0.15	0.08±0.04	0.05±0.03	0.19±0.10	0.24±0.13	0.08±0.04
	10	0.25±0.15	0.09±0.05	0.06±0.03	0.20±0.10	0.25±0.13	0.08±0.04
IV	11	0.40±0.08	0.16±0.03	0.10±0.01	0.35±0.07	0.40±0.05	0.14±0.01
SE	12	0.23±0.10	0.09±0.04	0.06±0.03	0.21±0.12	0.24±0.09	0.09±0.05
	13	0.21±0.14	0.07±0.03	0.07±0.04	0.17±0.09	0.30±0.15	0.09±0.04
	14	0.22±0.10	0.08±0.04	0.06±0.03	0.21±0.11	0.25±0.11	0.09±0.05
SUM	15	0.25±0.13	0.09±0.05	0.06±0.03	0.21±0.11	0.26±0.12	0.09±0.04
	16	0.32±0.14	0.12±0.05	0.08±0.03	0.27±0.12	0.35±0.15	0.12±0.06
NI	17	0.28±0.12	0.11±0.03	0.08±0.02	0.13±0.03	0.23±0.05	0.09±0.03
	18	0.22±0.06	0.12±0.02	0.08±0.02	0.14±0.05	0.22±0.05	0.10±0.02
	19	0.24±0.09	0.11±0.03	0.08±0.02	0.13±0.04	0.22±0.05	0.10±0.02
IV	20	0.20±0.00	0.06±0.00	0.06±0.00	0.11±0.00	0.18±0.00	0.08±0.00
SE	21	0.20±0.07	0.08±0.03	0.07±0.03	0.12±0.08	0.19±0.05	0.09±0.03
	22	0.17±0.02	0.11±0.02	0.08±0.03	0.13±0.04	0.20±0.06	0.10±0.02
	23	0.19±0.06	0.09±0.03	0.07±0.03	0.12±0.07	0.19±0.06	0.09±0.03
SUM	24	0.21±0.08	0.10±0.03	0.08±0.02	0.13±0.06	0.21±0.05	0.10±0.02
TA	25	0.16±0.02	0.09±0.01	0.08±0.02	0.13±0.04	0.21±0.05	0.11±0.03
	26	0.29±0.05	0.17±0.02	0.07±0.02	0.26±0.05	0.31±0.08	0.15±0.03
	27	0.28±0.07	0.16±0.03	0.07±0.02	0.25±0.06	0.30±0.09	0.15±0.03
KE	28	0.23±0.03	0.09±0.01	0.09±0.02	0.17±0.03	0.29±0.05	0.13±0.04
	29	0.22±0.09	0.11±0.04	0.09±0.02	0.18±0.04	0.32±0.08	0.15±0.05
	30	0.23±0.07	0.10±0.03	0.09±0.02	0.18±0.04	0.31±0.07	0.15±0.05
SUM	31	0.22±0.07	0.10±0.03	0.09±0.02	0.17±0.04	0.30±0.08	0.14±0.05
	32	0.26±0.07	0.14±0.04	0.08±0.02	0.22±0.07	0.30±0.08	0.15±0.04
SE	33	0.31±0.00	0.09±0.00	0.13±0.00	0.28±0.00	0.52±0.00	0.14±0.00

In the group level (Table 11), the widest (2.14 mm) was obtained in group **8**, followed by group **4** (2.03 mm) and group **13** (1.99 mm). These orders of groups (**8**>**4**>**13**) were found to be the same as in cases of L and W of UHG. The narrowest (1.79 mm) was noted in group **2**, which was the same as in case of L of HG, followed by group **3** (1.80 mm) and group **12** (1.82 mm). Averages and those s.d. through the whole strains belonging to the groups **34** and **35** were found to be 1.83 ± 0.14 and 1.87 ± 0.18 , respectively.

In the s.d. of each strain, the largest (0.34) was obtained in No. 2051, followed by No. 2056

(0.28) and No. 2073 (0.26). The smallest (0.00) was noted in No. 324, followed by Nos. 301, 378, 400 and 452 (0.02). In the group level, the largest (0.31) was obtained in group **8**, followed by group **13** (0.21), and groups **10** and **14** (0.18). It was noted that the value of group **8** was particularly large. These orders of groups (**8** > **13** > **10**) were found to be the same as in case of UHG, and these combinations of groups (**8**, **10** and **13**) were found to be the same as in case of L of HG. The smallest (0.05) was noted in group **4**, followed by group **11** (0.07) and group **9** (0.10). These orders of groups (**4** < **11** < **9**) were found to be the same as in case of UHG.

In the s.d. of each group (Table 12), the largest (0.17) was obtained in group **5**, followed by groups **6** and **11** (0.16). These combinations of groups (**5**, **6** and **11**) were the same as in cases of L of UHG and HG. The smallest (0.05) was noted in group **4**, which was the same as in case of UHG, followed by group **13** (0.07), and groups **9** and **14** (0.08). Averages and those s.d. in the whole strains belonging to the groups **34** and **35** were found to be 0.14 ± 0.05 and 0.09 ± 0.05 , respectively.

3. Thickness

Thicknesses for the individual grain level ranged from 1.90 mm (No. 336), which was the same as in cases of L (UHG) and W (UHG and HG), to 0.80 mm (Nos. 416 and 426). In the strain level, the thickest (1.68 mm) was obtained in No. 336, which was the same as in cases of W of UHG and HG, followed by No. 307 (1.65 mm) and No. 335 (1.62 mm). The thinnest (0.82 mm) was noted in No. 416, which was the same as in case of UHG, followed by No. 426 (0.97 mm), and Nos. 2009 and 2010 (1.11 mm). It was noticed that the value of No. 416 was very small.

In the group level (Table 11), the thickest (1.53 mm) was obtained in group **4**, followed by group **8** (1.48 mm) and group **7** (1.40 mm). The thinnest (1.24 mm) was noted in group **2**, followed by group **3** (1.25 mm) and groups **1**, **12** and **16** (1.31 mm). These orders of groups (**2** < **3** < **12**) were found to be the same as in cases of W of UHG and HG. Averages and those s.d. through the whole strains belonging to the groups **34** and **35** were found to be 1.29 ± 0.10 and 1.35 ± 0.12 , respectively.

In the s.d. of each strain, the largest (0.20) was obtained in Nos. 426 and 2051, in which the latter was the same as in cases of W of UHG and HG, followed by No. 2069 (0.15). The smallest (0.00) was noted in Nos. 324 and 414, followed by Nos. 301, 308, 310, 311, 339, 341, 345, 360, 369, 381, 400, 412, 436 and 440 (0.02). In the group level, the largest (0.26) was obtained in group **7**, followed by group **8** (0.16) and group **1** (0.13). It was noticed that the value of group **7** was particularly large. The smallest (0.05) was noted in group **11**, which was the same as in case of UHG, followed by groups **5** and **6** (0.07).

In the s.d. of each group (Table 12), the largest (0.10) was obtained in groups **2**, **4**, **5**, **6**, **8** and **11**. The smallest (0.05) was noted in groups **1** and **9**, followed by groups **7**, **10**, **12**, **14** and **15** (0.06). Averages and those s.d. in the whole strains belonging to the groups **34** and **35** were found to be 0.09 ± 0.03 and 0.06 ± 0.03 , respectively.

4. Ratio of length to width

Ratios of length to width (abbreviated as L/W) for the individual grain level ranged from 4.73 (Nos. 2058, 2061 and 2070) to 1.94 (No. 2073). In the strain level, the largest (4.49) was obtained in No. 440, followed by No. 377 (4.48) and No. 412 (4.05). These orders of strains (**440** > **377** > **412**) were found to be the same as in case of UHG. The smallest (2.79) was noted in No. 2073, followed by Nos. 336 and 2053 (2.87).

In the group level (Table 11), the largest (3.56) was obtained in group **12**, followed by group **14** (3.55) and group **13** (3.47). The smallest (3.05) was noted in group **8**, which was the same as in case of UHG, followed by group **7** (3.14) and group **11** (3.17). Averages and those s.d. through the whole strains belonging to the groups **34** and **35** were found to be 3.29 ± 0.22 and 3.45 ± 0.33 , respectively.

In the s.d. of each strain, the largest (0.58) was obtained in No. 426, which was the same as in case of T of HG, followed by No. 2070 (0.55) and No. 2056 (0.52). The smallest (0.03) was noted in No. 301, followed by Nos. 324, 357, 382 and 407 (0.06). In the group level, the largest (0.35) was obtained in group **10**, followed by group **9** (0.34) and group **15** (0.31). The smallest (0.11) was noted in group **7**, followed by group **13** (0.12) and group **4** (0.13).

In the s.d. of each group (Table 12), the largest (0.39) was obtained in group **5**, followed by group **6** (0.38) and group **11** (0.35). These orders of groups (**5**>**6**>**11**) were found to be the same as in case of L of HG. The smallest (0.13) was noted in group **4**, followed by group **13** (0.17) and group **9** (0.19). These orders of groups (**4**<**13**<**9**) were found to be the same as in case of W of HG. Averages and those s.d. in the whole strains belonging to the groups **34** and **35** were found to be 0.31 ± 0.10 and 0.22 ± 0.11 , respectively.

5. Ratio of length to thickness

Ratios of length to thickness (abbreviated as L/T) for the individual grain level ranged from 8.09 (No. 2044) to 3.11 (No. 371). In the strain level, the largest (7.13) was obtained in No. 416, which was the same as in case of L/T of UHG, followed by No. 426 (5.94) and No. 375 (5.47). It was noticed that the value was particularly large in No. 416. The smallest (3.97) was noted in No. 355, followed by No. 326 (4.04) and No. 385 (4.09).

In the group level (Table 11), the largest (4.97) was obtained in groups **12** and **14**, followed by group **13** (4.94). These combinations of groups (**12**, **13** and **14**) were found to be the same as in cases of L/W of HG and L/T of UHG. The smallest (4.37) was noted in group **4**, followed by group **8** (4.38) and group **11** (4.41). These combinations of groups (**4**, **8** and **11**) were found to be the same as in case of L/T of UHG. Averages and those s.d. through the whole strains belonging to the groups **34** and **35** were found to be 4.67 ± 0.23 and 4.77 ± 0.47 , respectively.

In the s.d. of each strain, the largest (0.88) was obtained in No. 2044, followed by No. 2062 (0.72) and No. 2049 (0.70). It was noticed that No. 2044 showed very large value. The smallest (0.04) was noted in No. 414, followed by No. 379 (0.06), and Nos. 339, 357 and 358 (0.07). In the group level, the largest (0.45) was obtained in group **12**, followed by group **14** (0.43) and group **15** (0.42). The smallest (0.11) was noted in group **7**, which was the same as in case of L/W of HG, followed by group **2** (0.17) and group **3** (0.21). It was noticeable that the value of group **7** was particularly small.

In the s.d. of each group (Table 12), the largest (0.46) was obtained in groups **5** and **6**, which were the same as in cases of T and L/T of UHG, followed by group **2** (0.45). The smallest (0.23) was noted in group **4**, which was the same as in cases of W and L/W of HG, followed by groups **9** and **12** (0.24). Averages and those s.d. in the whole strains belonging to the groups **34** and **35** were found to be 0.42 ± 0.14 and 0.26 ± 0.12 , respectively.

6. Ratio of width to thickness

Ratios of width to thickness (abbreviated as W/T) for the individual grain level ranged from 2.59 (No. 2062), which was the same as in case of W/T of UHG, to 0.97 (No. 364). In the strain

level, the largest (1.93) was obtained in No. 416, which was the same as in cases of L/T and W/T of UHG and L/T of HG, followed by No. 2073 (1.71) and No. 2022 (1.65). It was noticed that the value was particularly large in No. 416. The smallest (1.15) was noted in No. 440, which was the same as in case of W/T of UHG, followed by Nos. 358 and 377 (1.20).

In the group level (Table 11), the largest (1.46) was obtained in group 7, which was also the same as in case of W/T of UHG, followed by group 2 (1.45), and groups 3 and 8 (1.44). The smallest (1.33) was noted in group 4, which was the same as in case of L/T of HG, followed by group 9 (1.35) and group 10 (1.36). Averages and those s.d. through the whole strains belonging to the groups 34 and 35 were found to be 1.43 ± 0.08 and 1.39 ± 0.10 , respectively.

In the s.d. of each strain, the largest (0.31) was obtained in No. 2062, which was the same as in case of W/T of UHG, followed by No. 416 (0.24) and No. 2054 (0.21). The smallest (0.00) was noted in No. 324, which was the same as in cases of W and T of UHG and HG, followed by Nos. 301, 400 and 411 (0.02). These orders of strains ($324 < 301 = 400$) were found to be the same as in case of W. In the group level, the largest (0.12) was obtained in groups 12 and 14, followed by

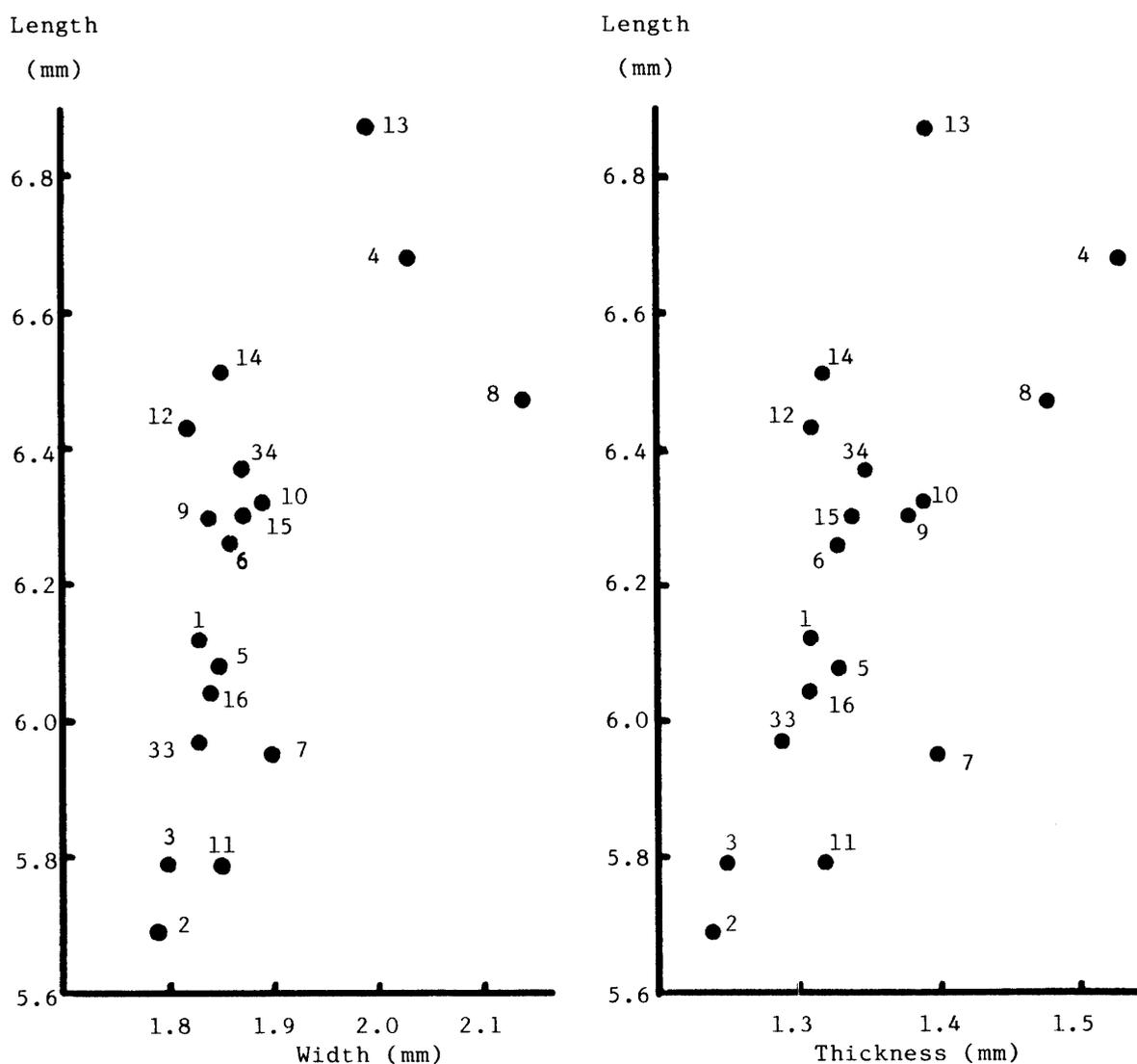


Fig. 1. Relations between length and width (left) and length and thickness (right) of husked grains in mm, *O. longistaminata*. Vertical axes; length, abscissa; width (left) and thickness (right). Code numbers used in the figure are corresponding to the group mark which was used in Table 11.

group 15 (0.10). These combinations of groups (12, 14 and 15) were found to be the same as in cases of W/T of UHG and L/T of HG. The smallest (0.03) was noted in group 11, which was the same as in cases of L and W/T of UHG, and T of HG, followed by groups 7 and 13 (0.06).

In the s.d. of each group (Table 12), the largest (0.16) was obtained in groups 2 and 5, followed by group 6 (0.15). These combinations of groups (2, 5 and 6) were found to be the same as in cases of T and W/T of UHG and L/T of HG. The smallest (0.08) was noted in groups 1, 4, 9 and 10, in which groups 4, 9 and 10 were the same as in case of W/T of UHG. Averages and

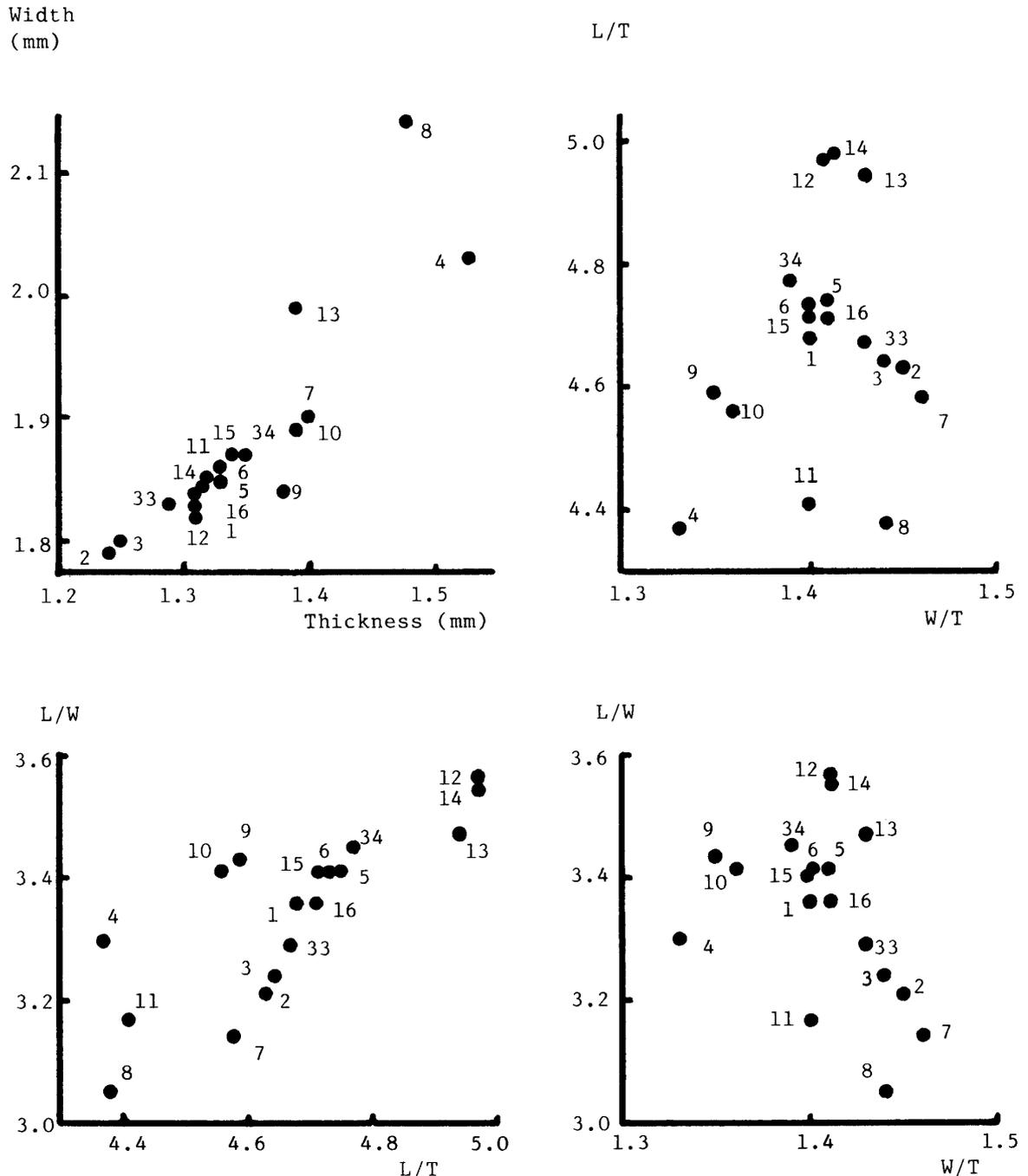


Fig. 2. Relations between the respective two characters of husked grains, *O. longistaminata*. Vertical axes; width (upper left), L/T (upper right) and L/W (lowers), abscissa; thickness (upper left), L/T (lower left) and W/T (rights). Code numbers used in the figure are corresponding to the group mark which was used in Table 11.

those s.d. in the whole strains belonging to the groups **34** and **35** were found to be 0.14 ± 0.05 and 0.09 ± 0.05 , respectively.

7. Further group comparison

Six character-relations are shown in Figs. 1 and 2, *i.e.*, relations between L and W, L and T (Fig. 1), W and T, L/W and L/T, L/W and W/T, and L/T and W/T (Fig. 2), respectively. To obtain the locality specificity, the comparison was made by the representatives of Madagascar (group **3** in the table), Tanzania (**6**), Kenya (**7**), Nigeria (**10**), Ivory Coast (**11**) and Senegal (**14**), and was shown in Table 13. From the data shown in Tables 11, 12 and 13, Figs. 1 and 2, the following locality specificities were ascertained to some extent.

Table 13. Comparison of values shown in the respective characters; 1=the largest, 6=the smallest, country and group marks are the same as those of Table 11. Upper column; practical values shown in Table 11, lower column; standard deviations shown in Table 12.

Country	Group mark	Practical value						Standard deviations					
		L	W	L	L/W	L/T	W/T	L	W	T	L/W	L/T	W/T
MD	3	5	6	6	4	3	2	4	3	4	5	5	4
TA	6	3	3	3	2	2	4	6	4	5	3	4	2
KE	7	4	1	1	6	4	1	5	3	1	6	6	5
NI	10	2	2	2	2	5	6	1	1	3	1	2	2
IV	11	5	4	4	5	6	4	3	5	6	4	3	6
SE	14	1	4	4	1	1	3	2	1	2	2	1	1
MD	3	3	3	3	3	2	2	4	3	2	3	1	1
TA	6	1	1	1	1	1	1	2	1	5	3	1	1
KE	7	4	4	4	4	4	4	2	3	1	5	1	1
NI	10	5	5	4	6	5	6	1	1	2	2	4	5
IV	11	2	1	1	2	3	2	6	6	6	6	6	6
SE	14	6	6	4	4	5	4	4	3	2	1	5	1

Grain type, in general, was said to be long in the strains collected in Senegal, and large in those of Nigeria. On the contrary, strains of Madagascar was relatively small. The strains of Kenya and Nigeria were looked upon as wide and thick types, and those of Ivory Coast and Senegal were found to be narrow and thin types, respectively. Strains of West Africa showed longer in length, wider in width and thicker in thickness in comparison with those of East Africa.

In case of the strain collected in Fogera Plain, Ethiopia ($12^{\circ}12'N$, $37^{\circ}30'E$)¹⁶⁾, average values and those s.ds. were found to be 6.11 ± 0.43 , 2.15 ± 0.28 , 1.38 ± 0.11 , 2.87 ± 0.26 , 4.43 ± 0.26 and 1.55 ± 0.15 in L, W, T, L/W, L/T and W/T, respectively. In comparison with the present data (Tables 11, 12 and 13), the strain of Ethiopia showed the following specificities. Average values of 2 characters, *i.e.*, W and W/T showed the largest ones through the whole groups of Africa. On the contrary, the values of L/T and L/W showed the smallest or nearly the smallest ones through the whole groups of Africa. The strain of Ethiopia should be located in the position relatively wider in width of wild rice in the *Oryza longistaminata* and its relatives distributed in the whole Africa. The finding was fixed to be the data of HG only, but clearly different from the data of UHG, in which the longer and thicker values were detected. The discrepancy should be explained to have been derived from the results of grain fullness⁸⁾.

II. *O. breviligulata* CHEV. et ROEHR.

1. Length

Lengths for the individual grain level ranged from 8.55 mm (strain No. 333, collected in Nigeria in 1984) to 5.15 mm (No. 405, collected in Senegal in 1985). In the strain level, the longest (8.22 mm) was obtained in No. 334, followed by No. 333 (8.06 mm) and No. 350 (7.92 mm). These orders of strains (334 > 333 > 350) were found to be the same as in case of L of UHG. The shortest (5.70 mm) was noted in No. 405, followed by No. 403 (5.78 mm) and No. 448 (6.00 mm), in which Nos. 405 and 403 were found to be the same as in case of L of UHG.

In the group level (Table 11), the longest (7.73 mm) was obtained in the strain collected in Ivory Coast in 1984 [illustrated as mark **20** in Table 11], followed by group **17** [Nigeria in 1984] (7.25 mm) and group **19** [Nigeria in 1984 and 1985] (6.93 mm). These orders of groups (**20** > **17** > **19**) were found to be the same as in case of L of UHG. It was noticed that the value was particularly large in group **20**. The shortest (6.32 mm) was noted in group **22** [northern region of Senegal in 1985], followed by group **23** [both regions of Senegal in 1985] (6.59 mm) and group **21** [Casamance region of Senegal in 1985] (6.70 mm). These orders of groups (**22** < **23** < **21**) were also found to be the same as in case of L of UHG. Average and its standard deviations (s.d.) through the whole strains belonging to the species (group **24** --summed-up of groups **17**, **18**, **20**, **21** and **22**) were found to be 6.78 ± 0.63 .

In the s.d. of each strain, *i.e.*, in those showing intra-population's variations, the largest (0.54) was obtained in No. 329, which was the same as in case of UHG, followed by No. 350 (0.35) and No. 376 (0.32). The smallest (0.05) was noted in Nos. 422 and 438, followed by No. 448 (0.14). It was noticed that the values of Nos. 422 and 438 were particularly small. In the group level, the largest (0.65) was obtained in group **22**, followed by group **17** (0.64) and group **24** (0.63). The smallest (0.20) was noted in group **20**, followed by group **18** (0.48), and groups **19** and **21** (0.57). It was noticeable that the value of group **20** was particularly small. These orders of groups (**20** < **18** < **21**) were found to be the same as in case of UHG.

The s.d. of husked grains illustrated by average values of the respective groups were shown in Table 12. The largest (0.28) was obtained in group **17**, followed by group **19** (0.24) and group **18** (0.22). The smallest (0.17) was noted in group **22**, followed by group **23** (0.19), and groups **20** and **21** (0.20). These combinations of groups (**21**, **22** and **23**) were found to be the same as in case of UHG.

2. Width

Widths for the individual grain level ranged from 3.10 mm (No. 328) to 1.30 mm (No. 428). In the strain level, the widest (3.00 mm) was obtained in No. 380, followed by No. 344 (2.94 mm) and No. 356 (2.89 mm). The narrowest (1.52 mm) was noted in No. 428, followed by No. 422 (2.04 mm) and No. 367 (2.14 mm). It was noticed that the value of No. 428 was particularly small. These orders of strains (428 < 422 < 367) were found to be the same as in case of UHG.

In the group level, the widest (2.63 mm) was obtained in group **22**, followed by groups **18** and **19** (2.62 mm). These combinations of groups (**18**, **19** and **22**) were found to be the same as in case of UHG. The narrowest (2.30 mm) was noted in group **20**, followed by group **21** (2.39 mm) and group **23** (2.46 mm). These orders of groups (**20** < **21** < **23**) were found to be the same as in case of UHG.

In the s.d. of each strain, the largest (0.17) was obtained in No. 328, followed by Nos. 376, 380 and 428 (0.15). The smallest (0.02) was noted in No. 398, followed by No. 417 (0.04), and Nos. 410 and 415 (0.05). In the group level, the largest (0.28) was obtained in group **21**, followed by groups **23** and **24** (0.26). The smallest (0.06) was noted in group **20**, followed by group **22** (0.11) and group **17** (0.17). These orders of groups (**20**<**22**<**17**) were found to be the same as in case of UHG.

In the s.d. of each group (Table 12), the largest (0.12) was obtained in group **18**, followed by groups **17**, **19** and **22** (0.11). These combinations of groups (**17**, **18**, **19** and **22**) were found to be the same as in case of UHG. The smallest (0.06) was noted in group **20**, followed by group **21** (0.08) and group **23** (0.09). These orders of groups (**20**<**21**<**23**) were found to be the same as in case of UHG.

3. Thickness

Thicknesses for the individual grain level ranged from 2.25 mm (No. 328) to 0.70 mm (No. 428). Both of the strains were the same as in case of W. In the strain level, the thickest (1.99 mm) was obtained in No. 328, followed by No. 330 (1.89 mm) and No. 380 (1.86 mm). These orders of strains (328>330>380) were found to be the same as in case of UHG. The thinnest (0.89 mm) was noted in No. 428, followed by No. 442 (1.37 mm), and Nos. 367 and 368 (1.39 mm).

In the group level, the thickest (1.80 mm) was obtained in group **17**, followed by group **22** (1.69 mm) and group **19** (1.68 mm). These combinations of groups (**17**, **19** and **22**) were found to be the same as in cases of T of UHG and L of HG. The thinnest (1.46 mm) was noted in group **20**, followed by group **21** (1.55 mm) and group **23** (1.59 mm). These orders of groups (**20**<**21**<**23**) were found to be the same as in cases of W of UHG and HG, and T of UHG.

In the s.d. of each strain, the largest (0.12) was obtained in Nos. 328, 428 and 456. These combinations of strains (328, 428 and 456) were found to be the same as in case of UHG. The smallest (0.02) was noted in Nos. 413 and 438, followed by Nos. 370 and 422 (0.04). These combinations of strains (413, 422 and 438) were found to be the same as in case of UHG. In the group level, the largest (0.19) was obtained in group **21**, followed by groups **23** and **24** (0.17). The smallest (0.05) was noted in group **22**, followed by group **20** (0.06) and group **17** (0.12). These orders of groups (**22**<**20**<**17**) were found to be the same as in case of UHG.

In the s.d. of each group (Table 12), the largest (0.08) was obtained in groups **17**, **18**, **19**, **22** and **24**. The smallest (0.06) was noted in group **20**, followed by groups **21** and **23** (0.07).

4. Ratio of length to width

Ratios of length to width (abbreviated as L/W) for the individual grain level ranged from 4.71 (No. 428) to 1.83 (No. 380). In the strain level, the largest (4.23) was obtained in No. 428, followed by No. 422 (3.77) and No. 334 (3.64). These combinations of strains (334, 422 and 428) were found to be the same as in case of UHG. The smallest (2.11) was noted in No. 446, followed by No. 380 (2.17) and No. 405 (2.22).

In the group level, the largest (3.37) was obtained in group **20**, followed by group **21** (2.86) and group **17** (2.82). These combinations of groups (**17**, **20** and **21**) were found to be the same as in case of UHG. It was noticed that group **20** showed very large value. The smallest (2.42) was noted in group **22**, followed by group **18** (2.63) and group **19** (2.69). It was noticed that group **22** showed very small value.

In the s.d. of each strain, the largest (0.40) was obtained in No. 428, followed by No. 350 (0.25) and No. 450 (0.21). It was noticed that No. 428 showed very large value. The smallest (0.04) was noted in No. 413, followed by No. 410 (0.05) and No. 347 (0.07). In the group level, the largest (0.52) was obtained in group **21**, followed by group **23** (0.51) and group **24** (0.46). The smallest (0.11) was noted in group **20**, followed by group **22** (0.34) and group **18** (0.37). These orders of groups (**20**<**22**<**18**) were found to be the same as in case of UHG. It was noticeable that group **20** showed very small value.

In the s.d. of each group (Table 12), the largest (0.14) was obtained in group **18**, followed by groups **17**, **19**, **22** and **24** (0.13). The smallest (0.11) was noted in group **20**, followed by groups **21** and **23** (0.12). These combinations of groups (**20**, **21** and **23**) were found to be the same as in cases of W and T of HG.

5. Ratio of length to thickness

Ratios of length to thickness (abbreviated as L/T) for the individual grain level ranged from 9.43 (No. 428) to 3.02 (No. 328). It was noticed that the value of No. 428 was particularly large, and being 3.65 larger than the value (5.78) of the following strain (No. 383). The tendency was the same as in case of UHG. In the strain level, the largest (7.32) was obtained in No. 428, followed by No. 383 (5.32) and No. 422 (5.09). The smallest (3.32) was noted in No. 446, followed by No. 448 (3.43), and Nos. 330 and 403 (3.44).

In the group level, the largest (5.32) was obtained in group **20**, followed by group **21** (4.45) and group **23** (4.25). It was noticed that the value of group **20** was particularly large. The smallest (3.71) was noted in group **22**, followed by group **17** (4.06) and group **19** (4.14).

In the s.d. of each strain, the largest (0.32) was obtained in No. 363, followed by No. 329 (0.31) and No. 367 (0.30). The smallest (0.10) was noted in No. 438, followed by No. 422 (0.11) and No. 430 (0.12). In the group level, the largest (0.88) was obtained in group **21**, followed by group **23** (0.84) and group **24** (0.70). These orders of groups (**21**>**23**>**24**) were found to be the same as in case of L/W of HG. Moreover, these combinations of groups (**21**, **23** and **24**) were found to be the same as in cases of W and T of HG. The smallest (0.18) was noted in group **20**, followed by group **22** (0.35) and group **18** (0.44). These orders of groups (**20**<**22**<**18**) were found to be the same as in cases of L/W of UHG and HG, and L/T of UHG.

In the s.d. of each group (Table 12), the largest (0.23) was obtained in group **17**, followed by groups **18** and **19** (0.22). These combinations of groups (**17**, **18** and **19**) were found to be the same as in cases of L, W, T and L/W of HG. The smallest (0.18) was noted in group **20**, followed by groups **21** and **23** (0.19). These combinations of groups (**20**, **21** and **23**) were found to be the same as in cases of W of UHG, and W, T and L/W of HG.

6. Ratio of width to thickness

Ratios of width to thickness (abbreviated as W/T) for the individual grain level ranged from 2.00 (Nos. 356 and 428) to 1.13 (No. 328). No. 428 was the same as in cases of L/T and W/T of UHG, and L/W and L/T of HG. No. 328 was the same as in cases of W/T of UHG and L/T of HG. In the strain level, the largest (1.73) was obtained in No. 344, followed by Nos. 356 and 428 (1.72). The smallest (1.35) was noted in No. 422, followed by No. 331 (1.37) and No. 398 (1.38).

In the group level, the largest (1.60) was obtained in group **18**, followed by group **20** (1.58). They were the same as in case of UHG. The smallest (1.44) was noted in group **17**, which was the same as in case of UHG.

In the s.d. of each strain, the largest (0.14) was obtained in Nos. 428 and 432, followed by Nos. 328, 353, 356 and 456 (0.13). The smallest (0.05) was noted in Nos. 331 and 413, followed by Nos. 330, 421 and 438 (0.06). In the group level, the largest (0.11) was obtained in group **19**, followed by groups **18** and **21** (0.09). The smallest (0.06) was noted in groups **17** and **22**, followed by groups **20** and **23** (0.08).

In the s.d. of each group (Table 12), the difference between the largest (0.10) and the smallest (0.08) was ascertained to be quite small.

7. Further group comparison

Six character-relations are shown in Figs. 3 and 4, *i.e.*, relations between L and W, L and T (Fig. 3), W and T, L/W and L/T, L/W and W/T, and L/T and W/T (Fig. 4), respectively.

In general, grain type was said to be longer in the strain collected in Ivory Coast, wider and thicker in the strains collected in Nigeria. The values of L/W, L/T and W/T were found to be the largest in the strain collected in Ivory Coast. It was noticed that the locality differences in the same country (groups **17** and **18** of Nigeria, and **21** and **22** of Senegal), were particularly large. Presumably it was due to the ecological background found in the respective niche.

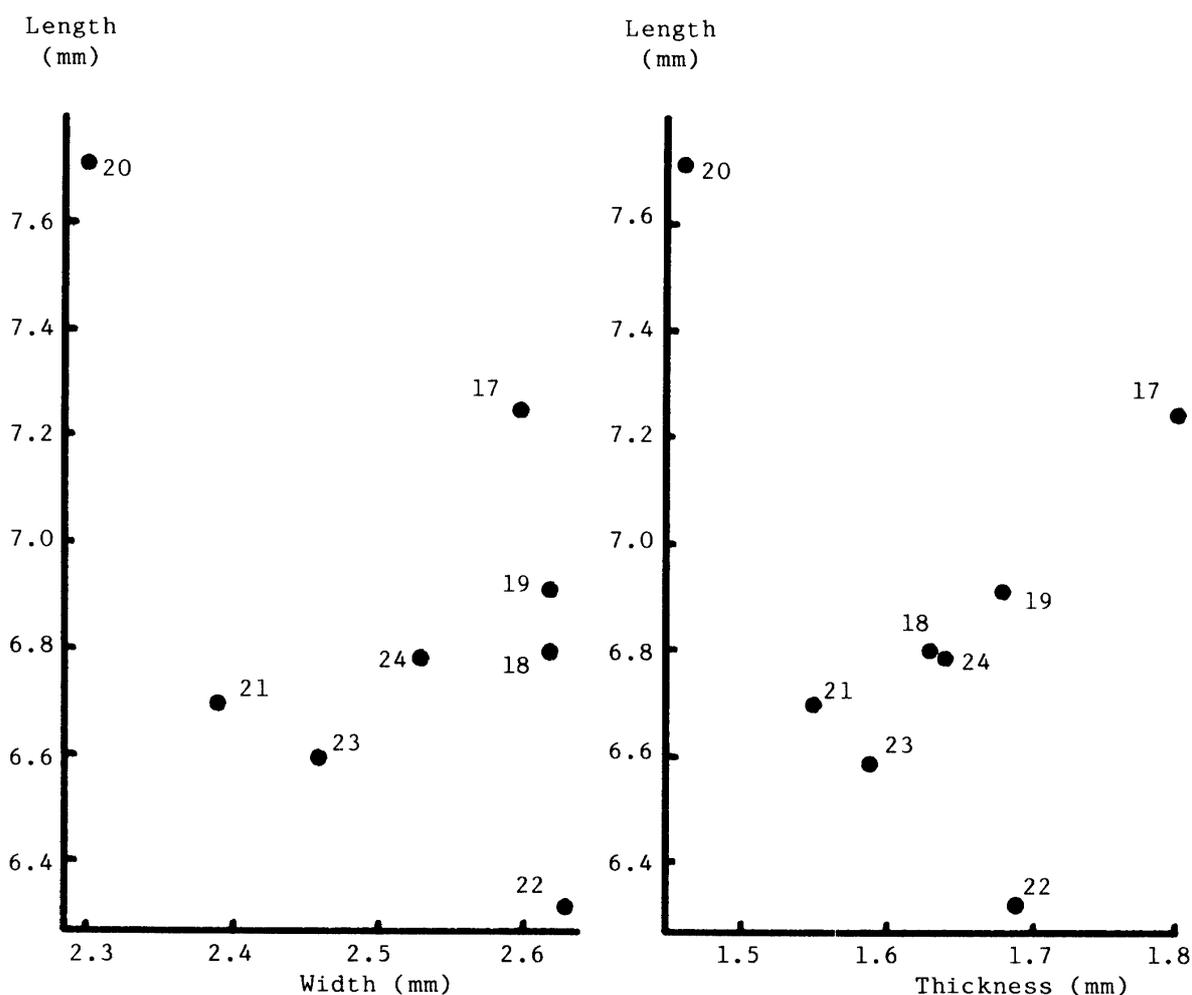


Fig. 3. Relations between length and width (left) and length and thickness (right) of husked grains in mm, *O. breviligulata*. Vertical axes; length, abscissa; width (left) and thickness (right). Code numbers used in the figure are corresponding to the group mark which was used in Table 11.

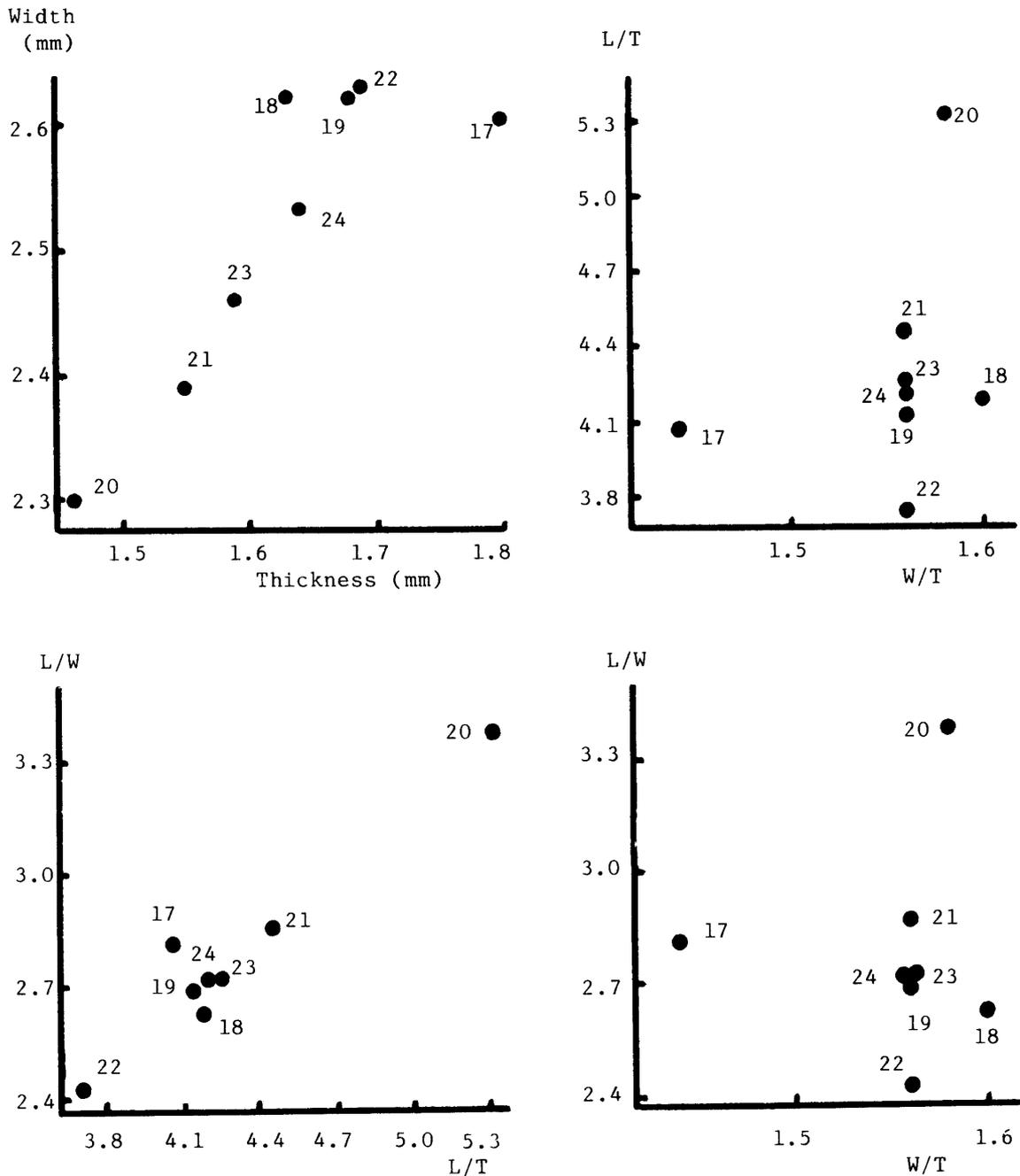


Fig. 4. Relations between the respective two characters of husked grains, *O. breviligulata*. Vertical axes; width (upper left), L/T (upper right) and L/W (lows), abscissa; thickness (upper left), L/T (lower left) and W/T (rights). Code numbers used in the figure are corresponding to the group mark which was used in Table 11.

III. *O. punctata* KOTSCHY

1. Length

Lengths for the individual grain level ranged from 5.55 mm (No. 2094) to 3.45 mm (No. 2097). In the strain level, the longest (5.11 mm) was obtained in No. 463, followed by Nos. 473 and 474 (5.08 mm). These combinations of strains (463, 473 and 474) were found to be the same

as in case of UHG. The shortest (4.03 mm) was noted in No. 470, followed by No. 2097 (4.07 mm) and No. 469 (4.10 mm).

In the group level (Table 11), the longest (4.69 mm) was obtained in strains collected in Tanzania in 1984 [illustrated as mark **25** in Table 11], followed by group **28** [Kenya in 1984] (4.68 mm) and group **31** [summed-up of strains in 1984 and 1985 in Tanzania and Kenya] (4.58 mm). These orders of groups (**25** > **28** > **31**) were found to be the same as in case of UHG. The shortest (4.39 mm) was noted in group **26** [Tanzania in 1988], followed by group **27** [Tanzania in 1984 and 1988] (4.42 mm) and group **32** [summed-up of strains in 1984, 1985 and 1988 in Tanzania and Kenya] (4.47 mm). These orders of groups (**26** < **27** < **32**) were also found to be the same as in case of UHG. Average and its standard deviations through the whole strains belonging to the species (group **32** --- summed-up of the groups **25**, **26**, **28** and **29**) were found to be 4.47 ± 0.28 .

In the s.d. of each strain, *i.e.*, in those showing intra-population's variations, the largest (0.45) was obtained in No. 2094, followed by No. 2091 (0.38) and No. 2092 (0.37). The smallest (0.10) was noted in No. 474, followed by Nos. 458 and 473 (0.14). In the group level, the largest (0.39) was obtained in group **29**, followed by group **30** (0.37) and group **31** (0.35). These orders of groups (**29** > **30** > **31**) were found to be the same as in case of UHG. The smallest (0.14) was noted in group **25**, followed by group **26** (0.18) and group **27** (0.20). These orders of groups (**25** < **26** < **27**) were also found to be the same as in case of UHG.

The s.d. of husked grains illustrated by average values of the respective groups were shown in Table 12. The largest (0.29) was obtained in group **26**, followed by group **27** (0.28) and group **32** (0.26). The smallest (0.16) was noted in group **25**, followed by groups **29** and **31** (0.22).

2. Width

Widths for the individual grain level ranged from 2.40 mm (Nos. 2085, 2098 and 2100) to 1.20 mm (No. 2089). Nos. 2085, 2100 and 2089 were found to be the same as in case of UHG. In the strain level, the widest (2.11 mm) was obtained in No. 2085, followed by No. 2098 (2.06 mm) and No. 2088 (2.04 mm). The narrowest (1.68 mm) was noted in No. 2089, followed by No. 2090 (1.74 mm) and No. 2105 (1.76 mm). These orders of strains (2089 < 2090 < 2105) were found to be the same as in case of UHG.

In the group level, the widest (2.05 mm) was obtained in group **25**, followed by group **31** (1.96 mm) and group **28** (1.95 mm). These combinations of groups (**25**, **28** and **31**) were found to be the same as in cases of L of UHG and HG, and W of HG. The narrowest (1.89 mm) was noted in group **26**, followed by group **27** (1.90 mm) and group **32** (1.92 mm). These orders of groups (**26** < **27** < **32**) were also found to be the same as in cases of L of UHG and HG, and W of HG.

In the s.d. of each strain, the largest (0.21) was obtained in No. 2019, followed by Nos. 2086, 2089, 2096 and 2100 (0.20). The smallest (0.06) was noted in Nos. 467 and 471, followed by Nos. 457, 461, 462, 472 and 474 (0.08). In the group level, the largest (0.11) was obtained in group **27**, followed by groups **26** and **32** (0.10). These combinations of groups (**26**, **27** and **32**) were found to be the same as in case of UHG. The smallest (0.02) was noted in group **25**, followed by group **28** (0.05). These orders of groups (**25** < **28**) were also found to be the same as in case of UHG.

In the s.d. of each group (Table 12), the largest (0.17) was obtained in group **26**, followed by group **27** (0.16) and group **32** (0.14). These orders of groups (**26** > **27** > **32**) were found to be the same as in case of UHG. The smallest (0.09) was noted in groups **25** and **28**, followed by groups **30** and **31** (0.10).

3. Thickness

Thicknesses for the individual grain level ranged from 1.60 mm (No. 2085) to 0.85 mm (No. 469). In the strain level, the thickest (1.37 mm) was obtained in No. 463, which was the same as in case of L of HG, followed by No. 457 (1.36 mm) and No. 458 (1.35 mm). The thinnest (1.06 mm) was noted in No. 469, which was the same as in case of T of UHG, followed by No. 461 (1.10 mm) and No. 467 (1.13 mm).

In the group level, the thickest (1.34 mm) was obtained in group **25**, followed by groups **27**, **28** and **31** (1.25 mm). These combinations of groups (**25**, **28** and **31**) were found to be the same as in cases of L and W of HG. The thinnest (1.22 mm) was noted in group **29**, followed by group **30** (1.23 mm), and groups **26** and **32** (1.24 mm).

In the s.d. of each strain, the largest (0.11) was obtained in No. 469, followed by Nos. 464, 467, 471, 2085 and 2094 (0.10). The smallest (0.03) was noted in No. 2100, followed by Nos. 474 and 2104 (0.04). In the group level, the largest (0.10) was obtained in groups **28** and **31**, followed by groups **29** and **30** (0.09). The smallest (0.02) was noted in group **25**, which was the same as in cases of L and W of UHG and HG, and T of UHG, respectively, followed by group **26** (0.05) and group **27** (0.06). These orders of groups (**25** < **26** < **27**) were found to be the same as in case of L of HG.

In the s.d. of each group (Table 12), the largest (0.09) was obtained in groups **28**, **29**, **30** and **31**. The smallest (0.07) was noted in groups **26** and **27**, followed by groups **25** and **32** (0.08).

4. Ratio of length to width

Ratios of length to width (abbreviated as L/W) for the individual grain level ranged from 3.38 (No. 2089) to 1.64 (No. 2097), in which the latter was the same as in case of L of HG. In the strain level, the largest (2.70) was obtained in No. 465, followed by No. 474 (2.68) and No. 2091 (2.59). The smallest (2.03) was noted in No. 471, followed by No. 470 (2.04) and No. 2099 (2.07).

In the group level, the largest (2.40) was obtained in group **28**, followed by group **30** (2.36). The smallest (2.30) was noted in group **25**, which was the same as in case of L/W of UHG, followed by group **29** (2.34).

In the s.d. of each strain, the largest (0.35) was obtained in Nos. 2090, 2091 and 2094. The smallest (0.09) was noted in No. 458, followed by Nos. 457 and 474 (0.11). In the group level, the largest (0.23) was noted in group **29**, followed by group **30** (0.21) and group **31** (0.19). These orders of groups (**29** > **30** > **31**) were found to be the same as in cases of L of UHG and HG, and L/W of UHG, respectively. The smallest (0.08) was noted in group **25**, followed by groups **26**, **27** and **28** (0.14). These combinations of groups (**25**, **26** and **27**) were found to be the same as in cases of L of UHG and HG, T and L/W of HG.

In the s.d. of each group (Table 12), the largest (0.26) was obtained in group **26**, followed by group **27** (0.25) and group **32** (0.22). These orders of groups (**26** > **27** > **32**) were found to be the same as in cases of L and W of HG, and L/W of UHG. Moreover, these combinations of groups (**26**, **27** and **32**) were found to be the same as in case of W of UHG. The smallest (0.13) was noted in group **25**, followed by groups **28** and **31** (0.17).

5. Ratio of length to thickness

Ratios of length to thickness (abbreviated as L/T) for the individual grain level ranged from 5.00 (Nos. 2092, 2093 and 2094) to 2.52 (No. 471). In the strain level, the largest (4.26) was obtained in No. 473, followed by No. 467 (4.14) and No. 474 (4.11), in which Nos. 473 and 474

were the same as in case of UHG. The smallest (3.03) was noted in No. 470, followed by No. 471 (3.11) and No. 2099 (3.13), in which Nos. 470 and 471 were also the same as in case of UHG. These combinations of strains (470, 471 and 2099) were found to be the same as in case of L/W of HG.

In the group level, the largest (3.77) was obtained in group **28**, followed by group **30** (3.75) and group **29** (3.74), in which the former two were the same as in case of UHG. The smallest (3.51) was noted in group **25**, followed by group **27** (3.56) and group **26** (3.57).

In the s.d. of each strain, the largest (0.48) was obtained in Nos. 469 and 2094, in which the former and the latter were the same as in cases of T, and L and L/W of HG, respectively, followed by Nos. 2091 and 2092 (0.46). The smallest (0.18) was noted in Nos. 457 and 459, followed by No. 2107 (0.20). In the group level, the largest (0.41) was obtained in group **29**, followed by group **30** (0.34) and group **31** (0.33). It was noticed that the value of group **29** was particularly large. These orders of groups (**29**>**30**>**31**) were found to be the same as in cases of L and L/W of UHG and HG. The smallest (0.11) was noted in groups **25** and **28**, followed by groups **26** and **27** (0.20). These orders of groups (**25**=**28**<**26**=**27**) were found to be the same as in case of L/T of UHG.

In the s.d. of each group (Table 12), the largest (0.32) was obtained in group **29**, followed by groups **26** and **30** (0.31), in which the former two were found to be the same as in case of UHG. The smallest (0.21) was noted in group **25**, which was the same as in cases of L, W and L/W of HG, respectively, followed by group **28** (0.29), and groups **27**, **31** and **32** (0.30).

6. Ratio of width to thickness

Ratios of width to thickness (abbreviated as W/T) for the individual grain level ranged from 2.47 (No. 469), which was the same as in case of UHG, to 1.08 (No. 2084). In the strain level, the largest (1.80) was obtained in No. 461, followed by No. 469 (1.78) and No. 467 (1.73), in which Nos. 461 and 467 were the same as in case of UHG. The smallest (1.39) was noted in No. 2089, followed by No. 2107 (1.43) and No. 2095 (1.46), in which the latter two were the same as in case of UHG.

In the group level, the largest (1.61) was obtained in group **29**, followed by group **30** (1.60), and groups **28** and **31** (1.59). The smallest (1.53) was noted in groups **25**, **26** and **27**, in which the latter two were the same as in case of UHG.

In the s.d. of each strain, the largest (0.25) was obtained in No. 469, which was the same as in cases of L/T of UHG and W/T of HG, followed by No. 473 (0.21), and Nos. 460 and 2084 (0.20). The smallest (0.08) was noted in Nos. 457 and 463, followed by No. 474 (0.09). In the group level, the largest (0.12) was obtained in group **28**, followed by groups **29**, **30** and **31** (0.11). The smallest (0.03) was noted in group **25**, followed by groups **26** and **27** (0.06). These combinations of groups (**25**, **26** and **27**) were found to be the same as in cases of L, T and L/W in UHG. It was noticeable that the values of group **25** were found to be the smallest in the whole characters of UHG and HG (6×2).

In the s.d. of each group (Table 12), the largest (0.15) was obtained in groups **26**, **27**, **29**, **30** and **32**. The smallest (0.11) was noted in group **25**, followed by group **28** (0.13) and group **31** (0.14). These combinations of groups (**25**, **28** and **31**) were found to be the same as in cases of W and L/W in HG.

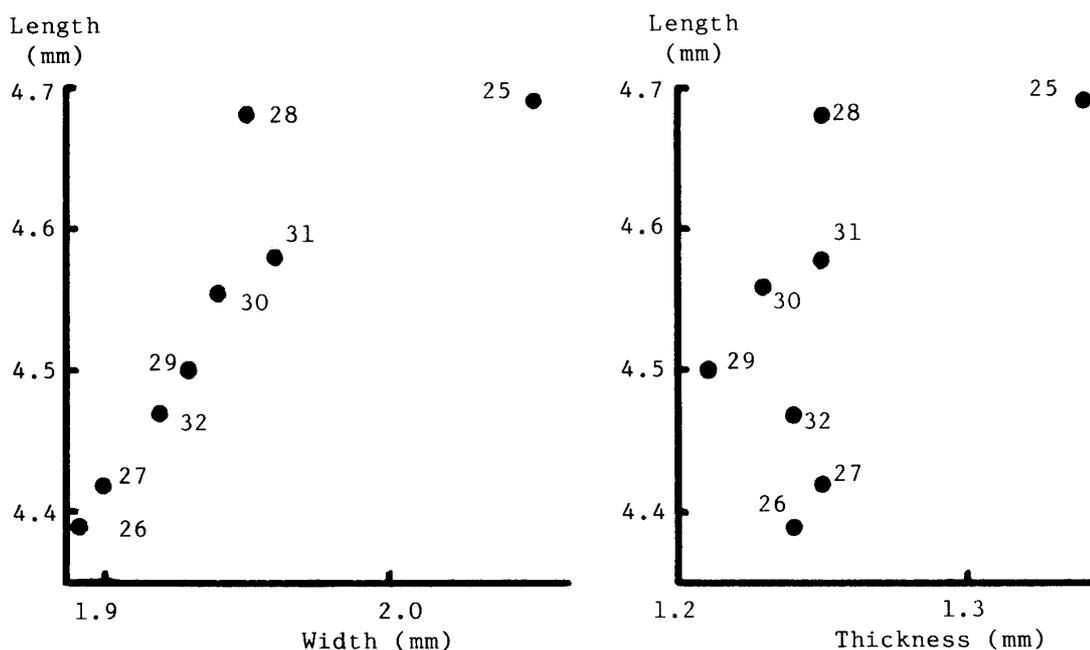


Fig. 5. Relations between length and width (left) and length and thickness (right) of husked grains in mm, *O. punctata*. Vertical axes; length, abscissa; width (left) and thickness (right). Code numbers used in the figure are corresponding to the group mark which was used in Table 11.

7. Further group comparison

Six character-relations are shown in Figs. 5 and 6, *i.e.*, relations between L and W, and L and T (Fig. 5), W and T, L/W and L/T, L/W and W/T, and L/T and W/T (Fig. 6), respectively.

It was noticeable that the practical values of group 26 showed the smallest or nearly the smallest ones. The s.d. of group 25 showed the smallest ones in the whole characters (=6), which was the same as in case of UHG.

To obtain the locality specificity, a comparison was made with the representatives of Tanzania (group 27 in the table) and Kenya (group 30). From the data shown in Tables 11 and 12, and Figs. 5 and 6, the following specificities were ascertained to some extent. Grain type, in general, was said to be longer in length, wider in width and thinner in thickness in Kenya. The former two characters were found to be the same as in case of UHG, but the last one character was found to be a reversed status to them. It may be due to the smallest value of T of group 29, which was the group collected in 1985. Three ratios, *i.e.*, L/W, L/T and W/T, were found to be larger in Kenya. In UHG, L/W was found to be smaller in Kenya.

In the s.d., T and L/T showed larger values in Kenya. On the contrary, L, W and L/W were found smaller in Kenya.

IV. *O. brachyantha* CHEV. et ROEHR.

Lengths for the individual grain level ranged from 7.60 mm to 6.20 mm. Average and its standard deviations (s.d.) in the whole grains were found to be $6.95 \text{ mm} \pm 0.31$. Widths for the individual grain level ranged from 1.80 mm to 1.40 mm. Average and its s.d. in the whole grains were found to be $1.59 \text{ mm} \pm 0.09$. Thicknesses for the individual grain level ranged from 1.45 mm to 1.00 mm. Average and its s.d. in the whole grains were found to be $1.26 \text{ mm} \pm 0.13$.

Ratios of length to width (L/W) for the individual grain level ranged from 4.90 to 3.88. Average and its s.d. in the whole grains were found to be 4.39 ± 0.28 . L/T for the individual grain

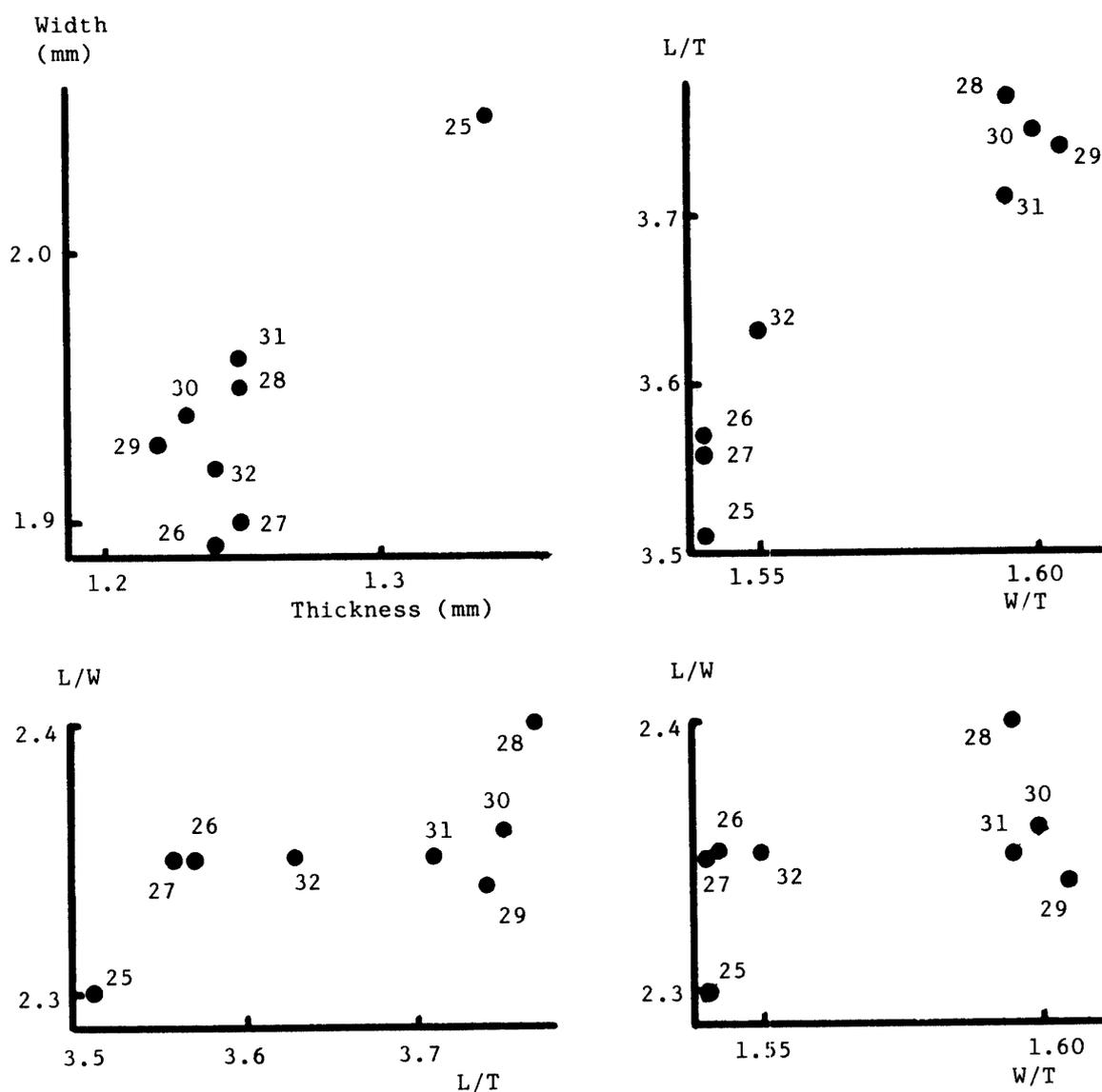


Fig. 6. Relations between the respective two characters of husked grains, *O. punctata*. Vertical axes; width (upper left), L/T (upper right) and L/W (lower), abscissa; thickness (upper left), L/T (lower left) and W/T (rights). Code numbers used in the figure are corresponding to the group mark which was used in Table 11.

level ranged from 6.70 to 4.69. Average and its s.d. in the whole grains were found to be 5.57 ± 0.52 . W/T for the individual grain level ranged from 1.55 to 1.03. Average and its s.d. in the whole grains were found to be 1.27 ± 0.14 .

Summary

During the periods from October to November in 1984, from August to November in 1985 and from May to August in 1988, the writer was dispatched to 8 countries of Africa, *i.e.*, Madagascar, Tanzania, Kenya, Nigeria, Ivory Coast, Liberia, Senegal and Gambia, for collecting the wild and cultivated rices. During the trips, 284 strains of wild rice, *i.e.*, 190 strains of *Oryza longistaminata* CHEV. et ROEHR., 49 of *Oryza breviligulata* CHEV. et ROEHR., 44 of *Oryza punctata* KOTSCHY, and 1 of *Oryza brachyantha* CHEV. et ROEHR., were collected and many populations of

them were observed. Some characters of their husked grains were reported in the present paper.

Average values and those standard deviations in the whole strains were found to be $6.14 \text{ mm} \pm 0.53$, $1.84 \text{ mm} \pm 0.16$, $1.31 \text{ mm} \pm 0.11$, 3.36 ± 0.28 , 4.71 ± 0.35 and 1.41 ± 0.09 in L, W, T, L/W, L/T and W/T, respectively, in case of the *O. longistaminata*. In general, the strains collected in Senegal, Nigeria and Madagascar were ascertained to be of long, large and small types, respectively.

In case of *O. breviligulata*, average values and those standard deviations in the whole strains were found to be $6.78 \text{ mm} \pm 0.63$, $2.53 \text{ mm} \pm 0.26$, $1.64 \text{ mm} \pm 0.17$, 2.73 ± 0.46 , 4.22 ± 0.70 and 1.56 ± 0.10 in the same order, respectively. The strain collected in Ivory Coast was longer, and the strains collected in Nigeria were of wider and thicker types, respectively. L/W, L/T and W/T were found to be the largest in the strain collected in Ivory Coast.

In case of *O. punctata*, average values and those standard deviations in the whole strains were found to be $4.47 \text{ mm} \pm 0.28$, $1.92 \text{ mm} \pm 0.10$, $1.24 \text{ mm} \pm 0.07$, 2.35 ± 0.16 , 3.63 ± 0.27 and 1.55 ± 0.09 , in the same order, respectively. The longer, the wider and the thicker characters were found in the strains collected in Kenya.

In case of *O. brachyantha*, average values were found to be 6.95 mm, 1.59 mm, 1.26 mm, 4.39, 5.57 and 1.27 in the same order, respectively.

Several character-specificities in morphological points and connection with one another were found. Basing on the analyses of the data obtained in the field survey, however, morphological, genetical and ecological characters, geographical, ecotypic and varietal differentiations should further be discussed and fixed in the future.

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