NOTE ON THE DISTRIBUTION OF ASH IN AN AUSTRALIAN WHEAT[1]

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The distribution of ash in hand-separated parts of the wheat kernel has been studied by Morris, Alexander, and Pascoe (5,6), Mambish (4), and Hinton (3). The aleurone layer was found to contain from 14.4 to 17.2% of ash, accounting for 56–60% of the total ash of the kernel (3). The endosperm accounted for 20–26% of the total ash, the concentration in the outermost part being about three times that in the central part. Four wheats were examined: Thatcher, Vilmorin 27, an Argentinian and an Egyptian sample. The ash contents of the kernel and of the central endosperm of 15 other wheat samples was also determined and no correlation between the ash of the central endosperm and that of the kernel was found. For example, two wheats with total ash 1.90 and 1.91% were found to contain central endosperm with ash content 0.28 and 0.47% respectively (3).

Australian wheat was not represented in this series; very low ash values are known among Australian wheats, though the flour extracted from them is not unusually low in ash content (1). This Note reports the results of an examination of a sample of Australian wheat carried out in the same way as in the previous study (3).

Materials and Methods

The wheat examined was a soft, white, export sample of Western Australian wheat with ash content of 1.22%. It contained about 50% of vitreous kernels and the kernels were predominantly long and narrow. The larger kernels of this type, with average weight 42.5 mg., were selected for dissection. They were clean and free from dust in the beard and crease.

The grains were dissected by hand, without chemical treatment. A low-power binocular microscope was used as previously described (3).

Results

The results are as shown in Table I. The ash figures, expressed on the basis of 14% moisture content, are means of from two to eight individual determinations obtained on two separate dissections. In addition, the ash content of central endosperm drilled from 200 ker-

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nels was determined, for comparison with the previous series of 15 wheats.

TABLE I

ASH CONTENT AND PROPORTION OF THE KERNEL OF DISSECTED FRACTIONS OF AUSTRALIAN WHEAT[a]

FRACTION	PROPORTION OF GRAIN	ASH CONTENT	ASH IN 100 G. GRAIN	PROPORTION OF TOTAL ASH OF GRAIN
	%	%	g	%
Pericarp, etc.	5.8	1.83	0.106	8.6
Aleurone layer	4.6	12.52	0.576	46.8
Endosperm 1	6.8	1.11	0.075	6.1
Endosperm 2	6.5	0.53	0.034	2.8
Endosperm 3	42.0	0.37	0.155	12.6
Endosperm 4	31.2	0.35	0.109	8.9
Total endosperm (86.5%)				30.4
Embryo	1.4	5.14	0.072	5.8
Scutellum	1.7	6.08	0.103	8.4
	100.0		1.23	100.0
Undissected grain			1.22	

[a] 14% moisture basis.

Figures relating to the wheats previously examined are compared with those for the Australian samples in Table II.

TABLE II

ASH OF THE KERNEL, ALEURONE LAYER, AND MEAN ENDOSPERM FOR FIVE WHEATS[a]

WHEAT	TOTAL ASH	ASH CONTENT OF ALEURONE LAYER	MEAN ASH CONTENT OF ENDOSPERM	PROPORTION OF ALEURONE LAYER IN KERNEL	ASH OF ALEURONE LAYER AS PROPORTION OF TOTAL ASH
	%	%	%	%	%
Australian	1.22	12.52	0.434	4.6	46.8
Egyptian	1.52	14.37	0.428	6.7	59.9
Vilmorin 27	1.63	14.72	0.574	7.0	56.4
Thatcher	1.68	17.22	0.477	6.7	60.2
Argentinian	1.89	17.03	0.502	6.4	58.7

[a] 14% moisture basis.

Discussion

The ash content of the whole kernel is lower than any in the series previously reported, in which the lowest figure was 1.38%. The ash of the central endosperm, 0.36%, however, was higher than that of 50% of this series, the lowest figure for which was 0.26%. The earlier finding, that there is little correlation between the ash content of the central endosperm and that of the kernel, is thus repeated. In the same

way, the mean ash of the endosperm, shown in Table II, bears no definite relationship with the ash content of the kernel.

On the other hand, the ash content of the aleurone layer is shown, in Table II, to exhibit some parallelism with the ash content of the kernel. The ash content of this layer in the Australian wheat is about 2% lower than the lowest figure obtained previously, thus extending the range of ash content for the aleurone layer.

An interesting feature brought out in Table II is the outstandingly low proportion of aleurone layer in the kernel of the Australian wheat, about 30% less than that of the other wheats, for which the values lie in a narrow range.

The combined effect of the low ash content of the aleurone layer and low aleurone layer content of the kernel is to reduce the proportion of the total ash present in the aleurone layer to 47%. This again is well below the range found for the other wheats, 56–60%. As a consequence, more of the ash is present in the endosperm, embryo, and scutellum; the proportion in the pericarp-testa-hyaline layer fraction is much the same as in the other wheats.

On the basis of the examination of five wheat samples it would be unsound to suggest that the Australian wheat is in a separate class from the others, though from the figures shown in Table II this might appear to be the case.

It is of interest to note that Western Australian wheat has been found to differ in another respect from three other types of bread-making wheat; namely, the permeability of the testa to water. The permeability was found to be very similar in Thatcher, Atle, and Holdfast, but significantly greater in Australian (2).

These indications suggest that a wider study of the varieties of wheat grown in Australia would be of much interest.

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