QUEENSLAND DEPARTMENT OF PRIMARY INDUSTRIES
DIVISION OF PLANT INDUSTRY BULLETIN No. 431

# A NOTE ON PREDICTION OF STARCH CONTENT IN SORGHUM GRAIN

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**Summary**

**At levels of about 8–10%, grain protein appears to be a fairly good index of starch content of sorghum grain grown in Queensland.**

Because of the increased interest in the use of sorghum starch for industrial purposes in Queensland, a survey of the starch content of grain sorghum grown in a number of Queensland districts was made. Forty-six samples, comprising 29 of Alpha, 12 of Texas 610, 3 of Brolga and 2 of Early Kalo, were analysed.

Starch was determined by the method of Roofayel (1967) and protein by the Kjeldahl method.

The results in Table 1 give no firm indication of any varietal or district effect on the quantity of starch formed in the grain. Grain starch percentages in samples from the Biloela district were generally lower than those in samples from the four other districts, but because of the small number of samples no firm conclusion on district effects can be drawn.

The table indicates that the starch content does bear some relationship to the protein content of the grain, since the range of starch plus protein is fairly small (83–88% of the dry grain). To ascertain whether the protein figure might be used as an index of the starch content of the grain, a regression line was calculated for starch percentage versus protein percentage, together with the error in the predicted starch percentage for a given value of protein. A plot of the data used and the regression line of

**TABLE 1**

STARCH AND PROTEIN IN SORGHUM GRAIN

| Variety | District | Percentage on Dry Basis* | | |
|---|---|---|---|---|
| | | Starch | Protein | Starch + Protein |
| Alpha .. .. | Biloela .. .. | 70·0 | 14·4 | 84·4 |
| | | 68·2 | 16·4 | 84·6 |
| | | 67·8 | 15·4 | 83·2 |
| | Capella .. .. | 76·0 | 10·7 | 86·7 |
| | | 72·9 | 13·4 | 86·3 |
| | Emerald .. .. | 72·9 | 12·8 | 85·7 |
| | Springsure .. | 76·3 | 8·7 | 86·0 |
| | | 75·8 | 10·2 | 86·0 |
| | | 74·9 | 12·7 | 87·6 |
| | | 73·4 | 14·2 | 87·6 |
| | | 72·1 | 11·9 | 84·0 |
| | | 70·2 | 15·3 | 85·5 |
| Texas 610 .. .. | Biloela .. .. | 68·6 | 16·5 | 85·1 |
| | Capella .. .. | 78·5 | 9·4 | 87·9 |
| | | 74·8 | 10·9 | 85·7 |
| | Emerald .. .. | 76·1 | 11·9 | 88·0 |
| | Hermitage .. | 76·5 | 11·2 | 87·7 |
| | | 73·1 | 12·4 | 85·5 |
| | | 70·7 | 13·4 | 84·1 |
| | Springsure .. | 77·0 | 9·3 | 86·3 |
| | | 76·3 | 11·2 | 87·5 |
| | Warwick .. .. | 78·0 | 8·7 | 86·7 |
| Brolga .. .. | Biloela .. .. | 68·0 | 15·4 | 83·4 |
| | Emerald .. .. | 75·4 | 11·8 | 87·2 |
| | Hermitage .. | 75·7 | 11·4 | 87·1 |
| Early Kalo .. .. | Hermitage .. | 75·7 | 11·4 | 87·1 |
| | Warwick .. .. | 75·6 | 10·0 | 85·6 |

* Range of moisture 9·1–12% (mean 10·7%).

Predicted starch percentage = 89·17—1·258 protein percentage are shown in Figure 1.

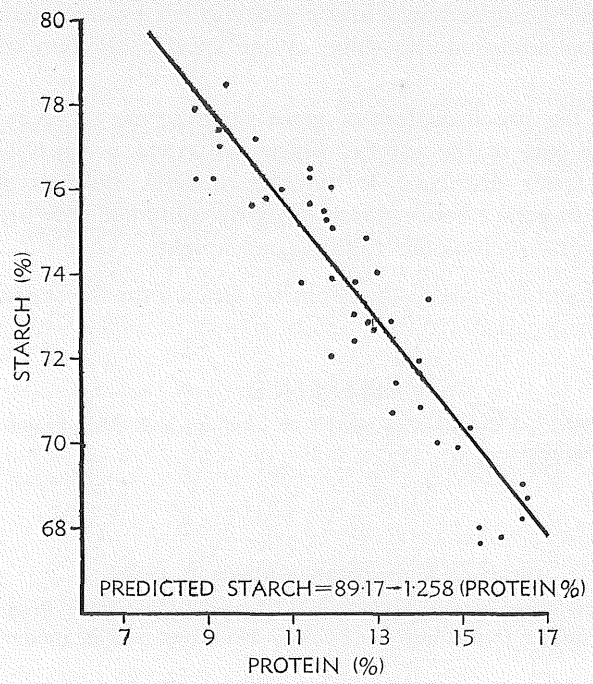


Fig. 1.—Plot of starch percentage versus protein percentage, and regression line for predicted starch percentage for a given protein percentage.

The standard error (Sy) in the predicted starch, using the regression line with a given protein percentage (P), was calculated as

$$Sy = 0{\cdot}03433 + 0{\cdot}00907\ (P)^2$$

From this equation it was found that an error of $\pm \frac{1}{2}\%$ starch can be expected in the predicted starch at a protein level of $8\% \pm 1\%$ starch at $10{\cdot}3\%$, $\pm 1\frac{1}{2}\%$ at $12{\cdot}5\%$ and $\pm 2\%$ starch at $14{\cdot}8\%$. It seems, then, that protein alone, especially at the lower percentages, is a fairly good index of the starch content of the grain. However, it is assumed from the increasing error in the predicted starch with increasing protein content that some other factor or factors are also influencing the starch content.

In view of the short time required to complete a protein or physical analysis (e.g. 1,000-kernel weight) on the grain compared with that of a starch estimation, such an analysis which yielded an index of starch percentage with an error of say $\pm 1\%$ about the analysed value would be an advantage. There is ample evidence in the literature to show that there are both physical and chemical differences between natural and processed starches. The exact amount of change produced in the natural starch is uncertain but it does depend on the reagents and physical conditions used in the method of estimation. For the polarimetric

methods of analysis, the uncertainty in the exact starch content could be as great as 1½% starch, depending on the value of the specific rotation of starch used in the calculations.

Influences on the starch content of grain sorghum are to be examined more closely in the next part of the survey, which will cover a much larger number of varieties from fewer districts. It may be possible, through developing an empirical formula, to gain a better starch index by using not only protein but also some physical property such as the 1,000-kernel weight.

Acknowledgement is made to the Biometry Branch for the statistical analyses.

## REFERENCE

ROOFAYEL, R. L. (1968).—Estimation of starch in sorghum and other grains. *Qd J. Agric. Anim. Sci.* In press.

(Received for publication March 7, 1967)

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