QUEENSLAND DEPARTMENT OF PRIMARY INDUSTRIES
DIVISION OF PLANT INDUSTRY BULLETIN No. 503

CORRELATION BETWEEN REFRACTIVE INDEX AND IODINE VALUE IN SUNFLOWER OIL FROM QUEENSLAND GROWN SEED

By G. F. HAYDON, B.Sc.

SUMMARY

A regression equation was derived and found to be satisfactory for estimating iodine value from the measured refractive index of sunflower oil obtained from varieties of *Helianthus annuus* grown in both northern and southern Queensland.

I. INTRODUCTION

It has been reported (Price 1967) that a regression equation derived for iodine value and refractive index in linseed oil is a rapid and reliable method for determining iodine value.

The purpose of this investigation was to see whether similar useful information could be obtained for sunflower (*Helianthus annuus*) seed oil. Oils from seeds grown at Walkamin, in northern Queensland, and Brookstead, in southern Queensland, were analysed.

II. MATERIALS AND METHODS

Samples.—The seeds were obtained from nine samples grown at Walkamin Research Station and 46 grown at Brookstead, on the Darling Downs. The 55 samples were analysed for refractive index at 25°C and iodine value. Seeds were pressed in a 5·5 cm stainless steel die in a hand-operated laboratory hydraulic press at 4,000–5,000 lb/sq in. The oil was expressed through Whatman No. 1 filter paper and decanted into glass tubes. Samples were stored until all sediment had settled before the analyses were begun.

Iodine value.—Wijs' method for measuring iodine value was used. The iodine monochloride reagent was prepared according to the method of Mehlenbacher (1960, p. 319). The acetic acid used was anhydrous and free

from reducing substances. Chloroform purified by distillation was used as a solvent for the oil rather than the more toxic carbon tetrachloride used by Mehlenbacher (1960, p. 321).

Sodium thiosulphate solution (0.1N) made up from analytical grade reagent was standardized as described in the Official Methods of Analysis of the Association of Official Agricultural Chemists (1965, p. 804) with the exception that specially purified primary standard potassium dichromate was used (prepared according to Hopkins and Williams specifications for potassium dichromate (Anon. 1960, App. B, 230)).

Duplicate determinations were made on each oil sample and each result was used in the statistical analysis.

Refractive index.—The refractometer was readable to four places of decimals. The instrument was an Abbe type with water-jacketed prisms. All results were obtained at 25° ± 0·1°C.

Three determinations were done on each sample, and again each result obtained was used in the statistical analysis.

III. RESULTS AND DISCUSSION

The least squares regression line calculated from all values of refractive index and corresponding iodine value is:—

$$\text{Iodine value} = 7596{\cdot}75\ (\text{R.I.} - 1{\cdot}4600) + 31{\cdot}236,$$

where R. I. is refractive index.

This equation is satisfactory for the rapid estimation of iodine values from 110 to 132, which correspond to refractive indices ranging from 1·4708 to 1·4732 at 25°C.

The variability of the measurements is shown below:

Iodine value:

standard deviation, = 0·694;
coefficient of variation, = 0·6%.

Refractive index:

standard deviation, $= 45 \times 10^{-6}$;
coefficient of variation, = 0·0003%.

When using the equation to calculate iodine values, the errors incurred and the limitations involved need to be known. The accuracy of the regression equation itself can be demonstrated. For example, if a particular refractive index is measured at say 1·4714, the equation gives

$$\text{I.V.} = 117{\cdot}9 \pm 3{\cdot}8,\ p = 0{\cdot}95;\ \text{and for}$$
$$\text{R.I. of } 1{\cdot}4720,\ \text{I.V.} = 122{\cdot}4 \pm 3{\cdot}9,\ p = 0{\cdot}95.$$

These figures cover a range of iodine values and show the nature of errors to be expected.

For the sake of brevity, not all analytical and statistical figures have been presented. However, for the rapid, reliable and simple determination of iodine value from refractive index measurements, the use of this equation is statistically justified.

IV. ACKNOWLEDGEMENTS

Appreciation is expressed to the Biometry Branch, in particular to Miss Jocelyn A. Tommerup, for the statistical analysis.

REFERENCES

ANON. (1960).—"Purification for Volumetric Standardization, P.V.S. Reagents". Overseas ed., Appendix B. (Hopkins & Williams Ltd: Chadwell Heath.)

ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS (1965).—"Official Methods of Analysis of the Association of Official Agricultural Chemists". 10th ed. (A.O.A.C.: Washington.)

MEHLENBACHER, V. C. (1960).—"Analysis of Fats and Oils". (Garrard: Champaign.)

PRICE, M. J. (1967).—*Qd J. Agric. Anim. Sci.* 24:1967.

(Received for publication June 23, 1969)

The author is an officer of Agricultural Chemical Laboratory Branch, Queensland Department of Primary Industries, and is stationed at Brisbane.