

## Technical Note

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### **Some Physico-Chemical Characteristics of Soybean, *Glycine max* Merr.**

*The compositional and physical characteristics of eleven varieties of soybean were determined. Analyses show that there was a considerable variation in thousand grain weight, husk, cotyledons and germ contents, hardness and bulk density. The variation was also evident in protein and oil contents.*

#### INTRODUCTION

Soybean is a unique legume crop which provides both protein and calories. It contributes to solving the protein energy malnutrition problems that exist in the rural parts of India where it is mostly cultivated in the black soils of dry farming regions. Madhya Pradesh is the leading state for soybean cultivation. Soybeans are processed into a number of products such as flours, oil, protein concentrates and isolates and various other fermented products. Many varieties of soybean are now being released by the plant breeders for commercialisation. Whether or not a variety is chosen for such commercial use depends on its nutritional value. Some eleven varieties of soybean—JS-76-205, Black local, JS-78-67, JS-2, MACS-13, JS-76-280, JS-75-46, JS-75-19, JS-72-44, Punjab-1 and Ankur—are popularly grown in Madhya Pradesh, but data on their physico-chemical characteristics are lacking. Hence, the present study is aimed at determining the various compositional and physical attributes of these varieties which help in their handling and utilization.

## MATERIALS AND METHODS

### **Soybean source**

The varieties of soybean used in this study were obtained from M.P. State Cooperative Oilseed Growers' Federation Ltd, Bhopal, India. These cultivars were harvested in November, 1983 and stored at 20°C.

### **Methods**

AOCS (1970) methods of analysis were used for the determination of various chemical constituents of the soyabeans. Physical characteristics were determined by means of available standard procedures. The analyses were carried out in quadruplicate and mean values were computed.

## RESULTS AND DISCUSSION

The seeds were analysed for various physical characteristics such as size, sphericity, thousand grain weight, bulk density and hardness and the resulting data are shown in Table 1. The thousand grain weight of the cultivars varied from 93.5 g to 184.0 g. The data on equivalent diameter and sphericity indicated that they are almost spherical. The husk content of these varieties varied from 7.14% to 9.5%. It was not influenced by the size of the grain. The cotyledons amount to 87.6% to 90.3% of the total seed, with 2.2% to 2.9% germ. Of the eleven varieties studied, JS-2 is the boldest grain. The hardness of these grains ranged between 13.9 kg/cm<sup>2</sup> and 18.3 kg/cm<sup>2</sup>.

The proximate composition of these cultivars is given in Table 2. The results clearly indicate that all the cultivars have high protein (39–44%) and oil (16–21%) contents. The ash and crude fibre contents are almost similar. The carbohydrates varied from 18% to 24%.

Thus, the present investigation again emphasises the importance of soybean from a nutritional point of view. They are a rich source of protein and oil.

**TABLE I**  
Physical Characteristics of Soybean

| Variety     | Colour of seed coat | Length | Size (mm)<br>Breadth | Thickness | Equivalent diameter (mm) | Sphericity | Husk | Seed composition (%)<br>Cotyledons | Germ | Thousand grain weight (g) | Hardness (kg/cm <sup>2</sup> ) |
|-------------|---------------------|--------|----------------------|-----------|--------------------------|------------|------|------------------------------------|------|---------------------------|--------------------------------|
| JS-76-205   | Black               | 6.9    | 5.9                  | 5.1       | 5.9                      | 0.86       | 9.2  | 88.4                               | 2.4  | 128.0                     | 16.4                           |
| Black local | Black               | 6.6    | 5.6                  | 4.7       | 5.6                      | 0.83       | 9.5  | 87.6                               | 2.9  | 104.7                     | 18.2                           |
| JS-78-67    | Golden yellow       | 6.6    | 6.2                  | 5.7       | 6.1                      | 0.93       | 7.14 | 90.32                              | 2.54 | 152.6                     | 14.5                           |
| JS-2        | Golden yellow       | 7.5    | 6.7                  | 5.6       | 6.5                      | 0.87       | 7.4  | 90.1                               | 2.5  | 184.0                     | 16.9                           |
| MACS-13     | Golden yellow       | 7.4    | 6.2                  | 5.3       | 6.3                      | 0.84       | 7.44 | 90.0                               | 2.56 | 115.7                     | 18.3                           |
| JS-76-280   | Golden yellow       | 7.1    | 5.9                  | 4.9       | 5.9                      | 0.82       | 8.00 | 89.45                              | 2.55 | 115.8                     | 18.2                           |
| JS-75-46    | Golden yellow       | 7.2    | 6.2                  | 5.5       | 6.3                      | 0.88       | 7.27 | 90.3                               | 2.43 | 155.0                     | 14.7                           |
| JS-75-19    | Golden yellow       | 6.9    | 6.4                  | 5.4       | 6.2                      | 0.89       | 7.40 | 90.0                               | 2.6  | 163.7                     | 16.4                           |
| JS-72-44    | Golden yellow       | 6.8    | 6.2                  | 5.4       | 6.1                      | 0.89       | 7.5  | 90.3                               | 2.2  | 138.7                     | 14.5                           |
| Punjab-1    | Golden yellow       | 6.7    | 5.3                  | 4.6       | 5.5                      | 0.81       | 9.0  | 88.5                               | 2.5  | 102.4                     | 13.9                           |
| Ankur       | Golden yellow       | 6.4    | 5.0                  | 4.0       | 5.0                      | 0.78       | 8.2  | 89.3                               | 2.5  | 93.5                      | 16.3                           |

**TABLE 2**  
Proximate Composition of Soybean

| Variety <sup>a</sup> | Protein (%) | Crude fat (per cent of cotyledons) | Ash (per cent of cotyledons) | Crude fibre (%) | Carbohydrate <sup>b</sup> (%) |
|----------------------|-------------|------------------------------------|------------------------------|-----------------|-------------------------------|
| JS-76-205            | 38.1        | 18.8                               | 5.0                          | 3.2             | 24.9                          |
| Black local          | 40.0        | 18.0                               | 5.3                          | 3.4             | 23.3                          |
| JS-78-67             | 39.9        | 19.2                               | 5.3                          | 3.5             | 22.1                          |
| JS-2                 | 43.9        | 19.6                               | 5.2                          | 3.6             | 17.7                          |
| MACS-13              | 42.3        | 18.2                               | 5.1                          | 3.2             | 21.1                          |
| JS-76-280            | 40.0        | 18.1                               | 5.0                          | 3.4             | 23.5                          |
| JS-75-46             | 39.0        | 21.0                               | 5.0                          | 3.3             | 21.7                          |
| JS-75-19             | 39.6        | 20.3                               | 5.4                          | 3.5             | 21.2                          |
| JS-72-44             | 43.8        | 17.11                              | 5.4                          | 3.5             | 20.2                          |
| Punjab-1             | 38.6        | 19.9                               | 5.0                          | 3.4             | 23.1                          |
| Ankur                | 40.8        | 16.5                               | 5.1                          | 3.6             | 24.0                          |

<sup>a</sup> All varieties had 10% moisture content (wet basis).

<sup>b</sup> Carbohydrate is determined by difference method.

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### REFERENCE

American Oil Chemists Society (AOCS) (1970). *Official and tentative methods of analysis: Methods* (3rd edn), American Oil Chemists Society, Chicago, Illinois, USA.

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