

Research Paper :

Studies on engineering properties of different varieties of sunflower (*Helianthus annuus* L.)

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ABSTRACT

An experiment “Studies on engineering properties of different varieties of sunflower was carried out in the Department of Agricultural Engineering at GKVK Campus of the University of Agricultural Sciences, Bangalore. Among the varieties of sunflower seeds studied for their engineering properties minimum and maximum length of 10.28 mm and 11.80 mm was observed in Sandoz-275 and ITC-104 varieties, respectively. Similarly, minimum and maximum breadth was observed in SHS-909 (4.18 mm) and ITC-104 (5.46 mm) varieties. Varieties Jaikisan and KBSH-44 recorded minimum and maximum seed thickness of 3.22 and 3.95, respectively. Single seed weight was maximum in KBSH-44 (0.075 g) and minimum in Sandoz-275 (0.050 g). Minimum and maximum size was observed in KBSH-41 (5.656 mm) and PASH-553 (6.291 mm) varieties. Pod sphericity was minimum and maximum in ITC-104 (0.462 mm) and PASH-553 (0.584 mm) varieties, respectively. Similar trend was also followed in bulk density. Maximum surface area was with PASH-553 (124.31 mm²) and minimum was in SHS-909 (99.90 mm²).

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The Sunflower (*Helianthus annuus* L.) belongs to family Compositae, a large and successful family of flowering plants occurring throughout the world. Its wider adaptability, day neutral nature and responsiveness to better management practices have played a significant role in its cultivation across varied agro-climatic zones within a span of three decades of its introduction in the country as a important oil seed crop.

India accounts for 3.9 per cent of sunflower oil and 4.4 per cent of the sunflower meal production in the world. Currently, the important sunflower growing states in India are Karnataka, Maharashtra, Andhra Pradesh, Haryana, Tamil Nadu, Punjab and Uttar Pradesh.

Karnataka is the largest sunflower producing state in the country which accounts for half of the total area under the crop and 30 per cent of total output (Anonymous, 2003). It is an important oil seed crop cultivated for its premier oil and manifold uses of both industrial and pharmaceutical importance. The most important commercial products produced from the sunflower are seed, seed oil and sunflower extractions. Sunflower oil has become major economic importance worldwide. The oil is used as cooking and salad oil and also used as a lubricant and illuminant. It is also used for manufacturing paints and varnishes, soaps, detergents and vanaspathy.

A number of research stations in the country are engaged in the cultivation of sunflower. Despite the extensive search, no published literature was found on

the detailed physical and engineering properties of sunflower seeds and their dependence on size grading which would be useful for design of processing equipment and machinery. The seeds of sunflower are subjected to various mechanical forces during threshing and post production operations. Physical properties of seeds such as size, shape, specific gravity and sphericity are required for design of various types of cleaning, grading and separation equipment. In design of an air screen cleaner, the shape and size of grain determine the shape and size of screen openings, angle of inclination, vibration amplitude and frequency of screens. The density of grain decides the size of screening surface. The shape of product is used for design of conveying equipment and calculating various cooling and heating loads of food materials. Frictional co-efficient of grains are needed for design and prediction of the motion of material in harvesting and handling equipment. Physical properties like density, size and shape are also required in calculating the terminal velocity of an object in the fluid which is useful for the design of air conveying or pneumatic separation equipment.

Moisture content of oil seeds was determined by placing 25-30 g of seed sample in hot air oven at 130°C for 72 hours (Hall, 1957). Physical and engineering properties of seeds are considered to be necessary for the proper design of equipment for handling, conveying, separating, cleaning, de-hulling, drying, mechanical