

ABSTRACT

Among the pulses, gram (Cicer arietinum L.) is not only cheap but also the most nutritious crop that contains protein (20%), carbohydrate, mineral, vitamins and provides 358 cal per 100 g of edible portion. These crop after the physiological maturity, if not harvested, dries up in a short span of time resulting in the increased possibility of dehiscence of pods, and shattering in the field during harvesting, transportation and handling. Keeping this in view, field experiments were conducted to establish the crop characteristics of two locally grown gram varieties (Vijaya and B-108) and to obtain their optimum growth-stages so as to achieve the maximum field yield and grain moisture as index of their harvesting stage.

Unlike threshing of cereals, threshing of gram involves pod detachment from pedicel and breaking of pod. Therefore, force and energy required to detach a pod, and force and energy required to break a pod under dynamic condition become the prime deciding factors in selecting various types of threshing elements, namely plastic covered peg tooth, plastic covered wire loop oriented at 0, 45 and 90° with the direction of impact. At each moisture levels, dynamic force and energy required to detach a pod as well as to break a pod were separately obtained using pendulum type impactor for both the varieties harvested at different days after sowing. Influence of each of the crop-element parameters was studied following the standard statistical analysis. Selection of the above parameters was done based on maximum yield, and minimum

dynamic force and energy required to detach a pod, at a time, in a scientific manner. In the similar manner, influence and selection of the above parameters on the dynamic force and energy required to break a pod were also carried out.

Commercially available mechanical threshers, not suitable for podded crops, like gram were modified with raspbar, plastic covered peg tooth and plastic covered 45° wire loop cylinders. The performance of each of the threshing cylinders was evaluated considering threshing efficiency (E_t), per cent mechanical damage (E_m), per cent unthreshed (E_u) and torque requirement. Dimensional analysis and multiple regression technique were applied to determine the influence of the independent π -terms on each of the dependent π -terms. Optimization of each of the independent parameters was done following the standard procedure and on the basis that the E_t be maximised, and E_m , E_u and T_n (torque number) be minimised, as far as possible for each crop variety.

Key words : Podded crops , gram , days after sowing (DAS) , yield , influence , pendulum type impactor , threshing element , selection , pod detachment , pod breakage , dynamic force/energy , quasi-static force/energy , gram thresher , evaluation , raspbar , peg tooth , wire loop , threshing efficiency , mechanical damage , per cent unthreshed , torque number , optimization .