“ENZYMATIC PRE-TREATMENTS ON PIGEON PEA (ICPL 87119) FOR BETTER RECOVERY AND QUALITY OF DHAL”

Key words: pigeon pea, enzymatic pre-treatment, hulling efficiency, protein content, cooking time.

Pigeon pea is one of the important pulse crop of India. Pigeon pea is consumed as dehusked splits and an important dietary constituent, especially for the vegetarian population of India, as a source of protein. The pigeon pea grain is considered as most difficult for dehulling as compared to other pulses. The traditional and improved pre-milling treatments lead to higher processing cost, less recovery, poor cooking quality, longer processing time as well as labour and energy consuming for pigeon pea milling. It also requires large space for milling. A novel pre-dehulling technique involving enzyme is prospective to improve dehulling efficiency upon reducing the dehulling loss and improving cooking quality of pigeon pea.

High-yielding pigeon pea variety ICPL 87119 was selected for the experiment. Commercial food grade enzymes xylanase, pectinase and cellulase were obtained from their manufacturers. These three enzymes Xylanase : Pectinase : Cellulase as 2 : 1 : 1 (50 %: 25 %: 25 %) were used in combination for enzymatic pre-treatments. The grains were cleaned manually to remove all foreign matters. The clean grains were then graded by manually operated size grader to obtain uniform sized grains. The effect of four enzymatic hydrolysis parameters, viz., enzyme concentration (20, 27.5, 35, 42.5 and 50 mg/100 g dry matter), incubation time (4, 6, 8, 10 and 12 h), incubation temperature (35, 40, 45, 50 and 55 °C) and tempering water pH (4.0, 4.5, 5.0, 5.5 and 6.0) on hulling efficiency, protein content and cooking time of pigeon pea.
dhal were optimized using response surface methodology. The treated samples were dried in a tray dryer at 60 °C Temp., 10 ± 0.5 % (d.b.) m.c. Dry milling method (oil treatment) was considered as control.

Enzymatic pre-treated and control samples of size 1 kg having about 10 ± 0.5 % moisture content (d.b.) were milled using laboratory dehusking machine/dhal mill. Samples were milled at the standard settings of the machine, i.e., 1420 rpm operating speed and 64 kg/h feed rate. After milling, all the fractions were collected in polyethylene bag. Each of the samples were milled separately. A Central Composite Rotatable Design (CCRD) of 4 variables at 5 levels each with 6 center point combinations were used for statistical analysis.

From the above study, it could be recommended that the better recovery and quality of pigeon pea dhal could be obtained by enzymatic pre-treatment of enzyme concentration of 29.83 mg/100 g dry matter, incubation time 7.50 h, incubation temperature 42.77 °C and tempering water pH 5.41 gave a hulling efficiency 82.52 %, protein content 22.15 % and cooking time 13.12 min. Hence, there was an increase in hulling efficiency of 16.23 %, protein content of 14.71 % and decrease in cooking time 23.78 % over oil treated sample (control). A quadratic model satisfactorily described the dehulling efficiency with high value for the coefficient of determination R² (0.82). The performance of this model was also verified by conducting an experiment for the validation. It could reveal that the experimental value was very close to the predicted value which confirmed the optimum conditions.