OPEN ACCESS Freely available online

Enzyme Engineering

Short Communication

The influence of mutations on the nutritional value of Rapeseed Meal (RSM)

Anubhuti Sharma

Indian Council of Agricultural Research, India

ABSTRACT

Background: Members of family cruciferae contain many health promoting and potentially protective phytochemicals including folic acid, phenolics, sinapines, carotenoids, selenium, glucosinolates and ascorbic acids. However, presence of antinutrients e.g. glucosinolates remains a limiting factor for the use of Rape Seed Meal (RSM) as animal feed. Mutation breeding method is rapid, potential and valuable tool to create genetic variability for various quantitative and qualitative characters in crop plants. Induced mutations are produced by the use of mutagenic agents like physical mutagens (x-rays, Gamma rays etc.) and chemical mutagens (alkylating agents, base analogues etc.). However gamma rays act on genetic material by ionization leading to more of chromosomal rather than point mutations and gamma rays are successfully used in plant breeding program because of its simple application, good penetration, reproducibility and high mutation frequency and less disposal problems.

Objectives: Two Indian mustard varieties were studied for biochemical analysis to explore the potential mutations (Physical and Chemical) for raising confidence in using oilseed meal in monogastric diets. This study will focus on the variability of RSM biochemical composition and the influences of mutation on this and major phytochemicals.

Methods: PM-21 & PM-30 were selected to study maximum diversity on oil content, whole-seed glucosinolate content, phytic acid, nutritional factors after the physical after gamma irradiation and EMS treatment. Seeds were grinded and defatted by hexane treatment to prepare seed meal samples. Biochemical characterization was carried out using standard laboratory methodologies for linoleic acid, oleic acid, MUFA, PUFA, total protein, total glucosinolate content, aliphatic glucosinolates, phytic acid, B-carotene and sinapine. A qualitative analysis & quantitative analysis by standard chemical protocol of secondary metabolites in the seeds of rapeseed mustard have been studied. Free and esterified phenolic acids of rapeseed were extracted with petroleum ether and determined by HPLC

Results: Oil stability index which is the ratio of MUFA: PUFA ranged from 1.34 to 0.56. Total protein content ranged from 30.33 g/100g to 34.84 g/100g. Glucosinolate content averaged 20.4µmol/g with an overall range (21.43-38.6µmol/g). Variation in glucosinolate content among genotypes, also suggest differences in their health promoting properties and the opportunity for enhancement of their levels through genetic manipulation (Kushad et al., 1999). The lower sinigrin content (>15 µmole/g) were also recorded in PM-21. However perusal of glucosinolate and sinigrin data clearly indicates the positive significant relationship between total glucosinolate and sinigrin content. Phytic acid averaged 2.83 g/100g and varied less (1.32-3.78 g/100g). -carotene content ranged from 4.00 to 6.00 ppm. Sinapine averaged at 8.68 mg/g (5.33-10.21 mg/g). HPLC analysis showed that p-hydroxy benzoic and sinapic acid are the most common phenolics present in almost all the varieties. Other phenolic acids such as caffeic acid, chlorogenic acid, protocatechuic acid and vanillic acid were also present in some genotypes in detectable amount.

Conclusion: Biochemical levels of all above studied parameters come closely to the published values for rapeseed meal and show comparatively little variation. -carotene, phytic acid and sinapine values were generally low with little potential for variety improvement of the cultivars. However the major cause of glucosinolate content variability is genetically controlled and therefore the RSM levels can be improved by controlling the standard set for varietal releases. Revalidation of work is under progress.

Biography:

She completed PhD in 2002 under the supervision of eminent academician Dr. Vinay Sharma and then she started the journey of career advancement. First she gave priority to UG & PG studies, with recent technologies involved in active teaching e.g. group discussion in the class, Tutorial & surprise tests to understand her students. Side by side she also started active research in the plant molecular biology to explore defense mechanism along with diversity in medicinally important plants. She guided six students for PhD degree and supervised 25 M.Sc. dissertations. She also worked as examiner for UG & PG practical courses at various universities in India.