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Influence of Varieties and Post-Harvest Treatments on Health-Promoting Glucosinolates Compounds in Cauliflower

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ABSTRACT: *Research work was carried out on Influence of varieties and post-harvest treatments on health-promoting glucosinolates compounds in cauliflower (*Brassica oleracea *L.,* var. botrytis*) in the Division of Post-Harvest Technology, Indian Agricultural Research Institute, New Delhi. Among cauliflower cultivars PusaSharad harvested during November, Pusa Hybrid-2 and PusaHimyoti harvested in December months were evaluated for glucosinolates content without pre-tratment and postharvest study, PusaSharad was found to have higher amount of glucosinolates (149.27 µmol/100 g) followed by PusaHimjyoti. To study the Influence of Post-harvest pre-treatment and film wrap on glucosinolates content throughout post-harvest life was carried out in Cauliflower Cv. Sweta by cutting the curd into florets and pre -treating with 150 ppm sodium hypo chlorite for 2 minutes and 1% citric acid for 5 minutes, were film wrapped with high-density polyethylene(HDPE) of 500 gauge thickness, low-density polyethylene (LDPE) and polypropylene (PP) of 100 gauge thickness and stored for 20 days at 5° C to study the glucosinolates content at the end of 20 days of post-harvest shelf life revealed that glucosinolates content was found to be higher in cauliflower packed in HDPE films (55.78 µmol/100 g) followed by LDPE (43.74 µmol/100 g) and PP packaging (48.89 µmol/100 g).*

Key words: *Cauliflower, glucosinolates, post-harvest pre-treatments, HDPE, LDPE, Polypropylene.*

INTRODUCTION

Cauliflower (*Brassica oleracea* L. var. *botrytis*) is one of the most important winter vegetables grown in India. This cruciferous vegetable is a power house of health promoting phytochemicals such as glucosinolates, vitamin C and phenolic compounds. Glucosinolates are unique class of sulphur containing glycosides responsible for characteristic flavour. These glucosinolates are known to have cancer chemoprotective activity (Fahey *et al.,* 2001; Kaur and Kapoor, 2001). The risk of cancer can be significantly reduced by an intake of as little as 10 g of cruciferous vegetable per day (Price *et al.,* 1998).

Glucosinolates are secondary metabolites in cruciferous vegetables and theirhydrolysis of these compounds formed by enzymatic or non-enzymatic action are biologically active with diverse effects on human health. The products of glucosinolates breakdown have been shown to act as anti-carcinogens by inhibition of the phase I enzymes and induction of the phase II enzymes that affect the xenobiotic transformations (Anil Kumar *et al.,* 2006) but quantitative variation in glucosinolate contentinfluenced by genetic factors, environment orseasonal variationand their interaction. The Quantitative differences of glucosinolate content were reported in cultivars of brussels sprouts, broccoli (Vallejo *et al.,* 2003) within the cultivars, stage of maturity also had an effect on glucosinolate content.

Seasonal effects on glucosinolate content were reported by Rosa *et al.* (2001) in broccoli. Winter or autumn seasons induce lower glucosinolate level due to short day, wet condition, cool temperature and less radiation. Broccoli grown in late season (December sowing) had more glucosinolate than early (March sowing) season (Vallejo *et al.,* 2003). But there is no report on seasonal, varietal and post-harvest pre-treatment influence in quantitative variation of glucosinolatescontent in cauliflower. Post-harvest pretreatments includes minimal processing

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operations like cutting, shredding, washing etc., to prepare 'Ready-to-use' vegetables cause the cell rupture and membrane damage due to minimal processing would have paved the way to myrosinase to come into contact with glucosinolatesto degrade them (Hansen *et al.,* 1995). In addition to this, comparatively higher concentration of O_2 in LDPE would have been the responsible factor for degradation of glucosinolates (Rangkadilok*et al.* 2002). Therefore, the purpose of present work was to study the influence of varieties and post-harvest pretreatment like minimal processing, film wraps on post-harvest behavior of glucosinolates content in the edible portions of fresh harvested cauliflower curd.

MATERIALS AND METHODS

Fresh harvested curds of uniform size and maturity of three cauliflower varieties *viz*., PusaSharad, Pusa Hybrid-2 and PusaHimjyoti were obtained from the Unit of Vegetable Research and Demonstration, Indian Agricultural Research Institute, New Delhi. Immediately after harvest, they were transported to Division of Post-Harvest Technology, New Delhi. Outer leaves were removed and the curds were washed with tap water. Each variety was considered as one treatment. In each variety, six replications with 5 curds each were taken for the analysis of glucosinolate. For post-harvest pre-treatment fresh harvested cauliflower curds Cv. sweta were obtained from commercial grower, Najafgarh, New Delhi. They were transported to Post Harvest Technology laboratory, Indian Agricultural Research Institute, New Delhi within 4-5 hours of harvest. They were washed with tap water and cut into florets (5.5 cm × 3 cm) using sharp serrated knife. The florets were then washed again and air dried. Florets were pre-treated with 150 ppm sodium hypo chlorite for 2 minutes and 1 % citric acid for 5 minutes, wrapped with high-density polyethylene(HDPE) of 500 gauge thickness, low-density polyethylene (LDPE) and polypropylene (PP) of 100 gauge thickness and stored for 20 days at 5° C to study the glucosinolates content at the end of 20 days of post-harvest shelf and The experiment was laid as a completely randomised design. Glucosinolateswas estimatedat the end of storage.

Glucosinolates were analysed as per the method described by Vallego *et al.* (2002). Florets were ground into a fine powder. Powder (1g) was extracted with 3.5 ml of 70% methanol. The extracts were heated at 70 °C in a water bath for 10 min, then centrifuged (500g, 10 min., 4 °C) to remove particulate matter. The supernatants were decanted. The remaining pellets were re-extracted with 3.5 ml of 70% methanol to ensure complete extraction and the extracts were again centrifuged (500g, 10 min., 4 °C). The two supernatants were combined and made up to a final volume of 5 ml with 70% methanol.

Desulphation and initial separation of desulphoglucosinolates were performed using columns. Columns were prepared by sephadex A35 and 2 M acetic acid (1:1 W/V). These columns were washed with 2 ml of 6 M imidazole formate followed by 2 x 2 ml water (HPLC grade). One ml methanol extract was loaded onto a column and washed with 2x1 ml of 0.1 M sodium acetate (pH 4.0). Sulphatase (100µl) was loaded onto column and desulphation was done overnight (12 h) at room temperature. The desulphoglucosinolates were eluted with 3 x 500 µl of water. Sinigrin (2- Propenylglucosinolate) of 3 mM concentration (in 70% Methanol) was used as a standard.

Each sample (20µl) was analysed on a HPLC system (Thermo Separation Product Model Spectra System P 2000) consisting of UV detector set at 227 nm and a RP-18 column (5 µm particle size). The flow rate was 1.5 ml /min. The mobile phase was a mixture of water and acetonitrile (4:1). The amount of glucosinolates was expressed as µmol/100g of sinigrin.

RESULTSAND DISCUSSION

Significantly higher levels of glucosinolates (149.27 µmol/100 g) were estimated in Pusa Sharad compared to Pusa Himyoti (85.44 µmol/100 g) and Pusa Hybrid-2 (63.74 µmol/100 g) (Figure 1). The variation in glucosinolates content may be due to genetic variability among the cultivars.The biosynthesis of glucosinolates depends on various factors such as genetic factors, stage of maturity, season and fertigation in various cole crops. Winter or autumn seasons slow down glucosinolates biosynthesis due to short day, wet condition and cool temperature. Since the cauliflower cultivars were harvested in different seasons having variability in temperature, the variation in glucosinolate could possibly be due to the season.

During the 20 days of storage period at 5° C the glucosinolates content was found to be the higher in cauliflower packed in HDPE films (55.78 mmol/g) followed by LDPE (48.89 mmol/g) and PP packaging(43.74 mmol/g) (Figure 2). The lower content of glucosinolates in cauliflower florets packed in LPDE might be due to cell rupture and membrane damage would have paved the way to myrosinase to

come into contact with glucosinolates and minimally processed vegetables are living tissues that are undergoing catabolic activities. Packaging of minimally processed cauliflower in permeable polymeric film can reduce O_2 concentration and increase CO_2 concentration in the package atmospheres, thereby affecting quality attributes. Finally we concluded that The amount of glucosionolates is influenced by varieties. Higher amount of glucosinolates was estimated in early variety of cauliflower than late variety. The glucosinolates content was found to be the higher in minimally processed cauliflower film wrapped with HDPE films followed by LDPE and PP packaging.

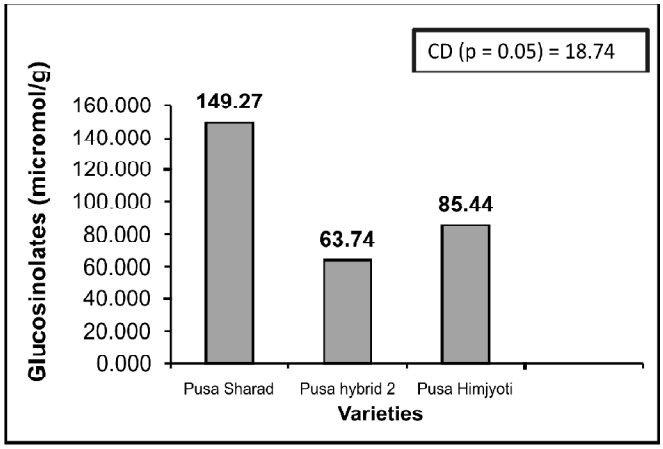

Figure 1: Varietal influence on the glucosinolates of cauliflower

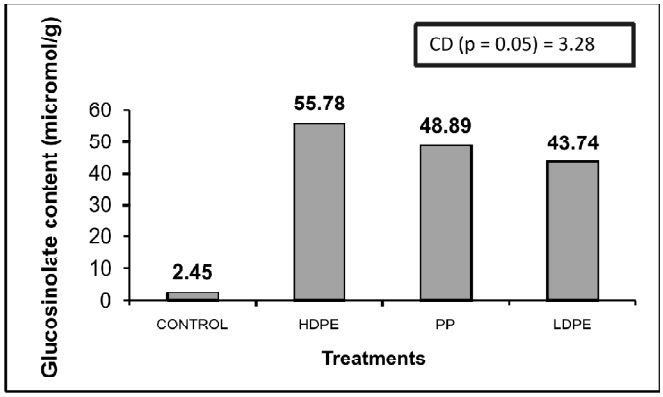

Figure 2: Effect of packaging material on glucosinolates in minimally processed cauliflower

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