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Short communication

Induction of branching in nursery pear plants through benzyladenine and heading back

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ABSTRACT

The effect of benzyladenine (BA) and heading back on the development of lateral shoots in pear (cvs Patharnakh and Punjab Beauty) nursery plants was investigated. Plants were applied with BA sprays (400, 600 & 800 ppm) and heading back treatments at 60, 75 and 90 cm (control). BA 600 ppm was the most effective treatment for improving the total number of lateral shoots and crotch angle, but a higher number of laterals <50cm or >50cm/plant were recorded in BA 800 ppm treatment. BA applications significantly increased the total length of laterals, diameter of stem and mean spread of plants compared to heading back treatments. Control plants recorded maximum plant height. The plant spread and height was greater in Patharnakh plants than Punjab Beauty plants. It can be concluded that BA applications were effective to induce laterals initiations in pear nursery plants.

Key words: *Pyrus spp.*, lateral shoots, crotch angle, stem diameter.

Due to availability of low chill cultivars, pear (*Pyrus spp.*) became one of the most important temperate fruit crop cultivated in sub-tropics of northwestern India. In province Punjab, the area under pear cultivation is dominated by cultivar Patharnakh followed by Punjab Beauty. Under subtropical conditions, young nursery pear plant tends to put up vigorous vegetative growth with strong apical dominance behavior. These plants often sprout from topmost buds leaving basal buds unsprouted and do not develop desired canopy structure. The high headed pear plants have low precocity and liable to limb breakage owing to poor crotch angles. Apical dominance in these plants can be removed by various methods like heading back (by removing auxin production site) and application of growth regulators. Heading back at 60 cm significantly increased number of laterals in one year old sweet cherry trees Moghadam and Zamanipour, 4). The application of BAP plays an important role in overcoming apical dominance and formation of well-feathered plants in apple nursery (Doric *et al*., 2 and Wertheim and Webster, 8). Hence, the present study was therefore conducted to examine the effectiveness of BA and mechanical heading back on feathering behaviour of nursery plants of the pear cultivars Patharnakh and Punjab Beauty.

The experiment was conducted during the cropping year 2016 and 2017 at fruit research farm, Department of Fruit Science, Punjab Agricultural University, Ludhiana. One year old unfeathered nursery plants of pear cvs. Patharnakh and Punjab Beauty grafted on *Pyrus pashia* were planted in the month of January at the spacing of 3x 3 m in a square system of planting. After planting all the plants, were headed back at a uniform height of 90 cm from the ground level except for heading back treatments of 60 cm and 75 cm. BA treatments (400, 600 and 800 ppm) were applied as foliar sprays at 10 days after full bloom and subsequent two sprays were given at 7 day interval. Spray treatments were applied to slight run-off loss using low pressure hand sprayer. The experimental plot was divided into separate blocks for two cultivars and each block comprised 42 selected plants with 7 replications per treatment. All the plants shared similar orchard management operations and microclimate. Phenotypic observations were recorded at the end of the vegetative phase of plant growth in the autumn season. Plant height and spread of plant (mean of E-W and N-S directions) were estimated by steel measuring tape. The diameter of stem 2.5 cm above the bud union was recorded by digital vernier caliper (Mitutoyo, Japan). Total numbers of feathers, number of feathers measuring>50 cm and<50 cm were counted. The total length of feathers per plant was estimated by aggregating the length of all feathers of the plant. Crotch angle of feathers was measured at the branch base with the main axis in pear plants with the aid of transparent protractor as degree divergence from the main axis. The experiment was set up as a

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randomized block design and the data analysis was performed using SAS version 9.3 (SAS Institute, Inc, 1992; Cary, NC, USA). The data were subjected to analysis of variance and Tukey HSD test were used to compare the treatments at $p < 0.05$. Results were expressed as a pooled mean of two years.

Various treatments significantly affected the number of laterals of pear nursery plants. In *cv* Patharnakh, maximum (9.62) laterals/plant was observed in BA 600ppm treatment while in cv Punjab Beauty BA 800 treatment produced maximum (9.47) laterals/plant(fig 1A). Plants headed back at 90 cm (control) recorded minimum (4.23) side shoot formation in both the cultivars. Earlier studies also showed that BA applications lead to the emergence of higher bud growth (Ghasemi and Khosh-Khui, 3) and the greater number of feathers in nursery plants (Rossi *et al*., 5). Significant differences in a number of laterals <50cm and number of laterals >50cm per plant were observed with various treatments. In cultivar Patharnakh, the maximum (2.79) number of laterals <50 cm were observed in BA 400 ppm treatment while in Punjab Beauty highest (3.79) value was recorded in BA 800 ppm application (fig 1B). Control plants recorded minimum (0.74 and 1.07) number of laterals<50 cm in cvs Patharnakh and Punjab Beauty, respectively. Among two cultivars, Punjab Beauty recorded a higher number of laterals<50 cm as compared to Patharnakh plants. Similarly, a significantly greater

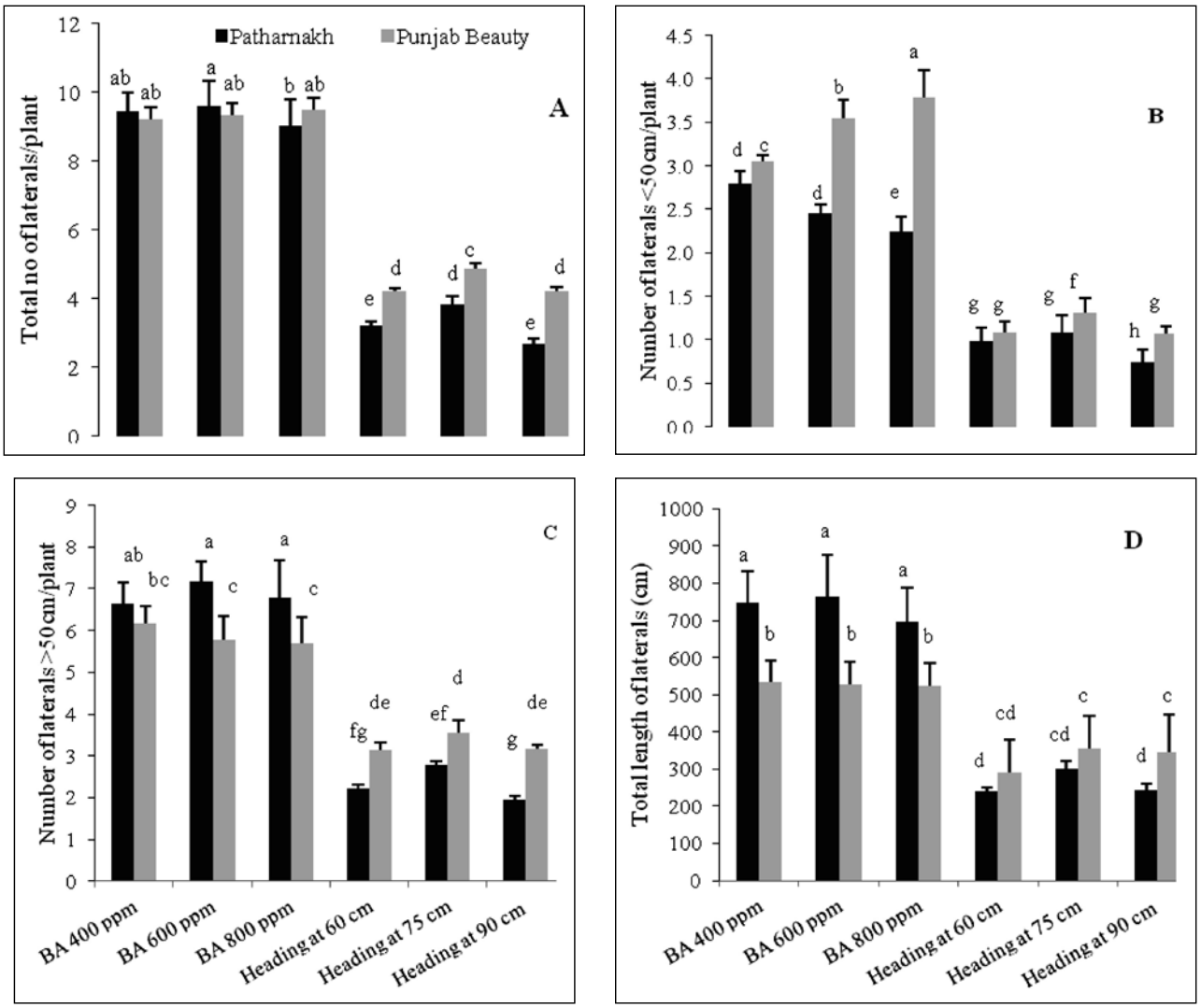
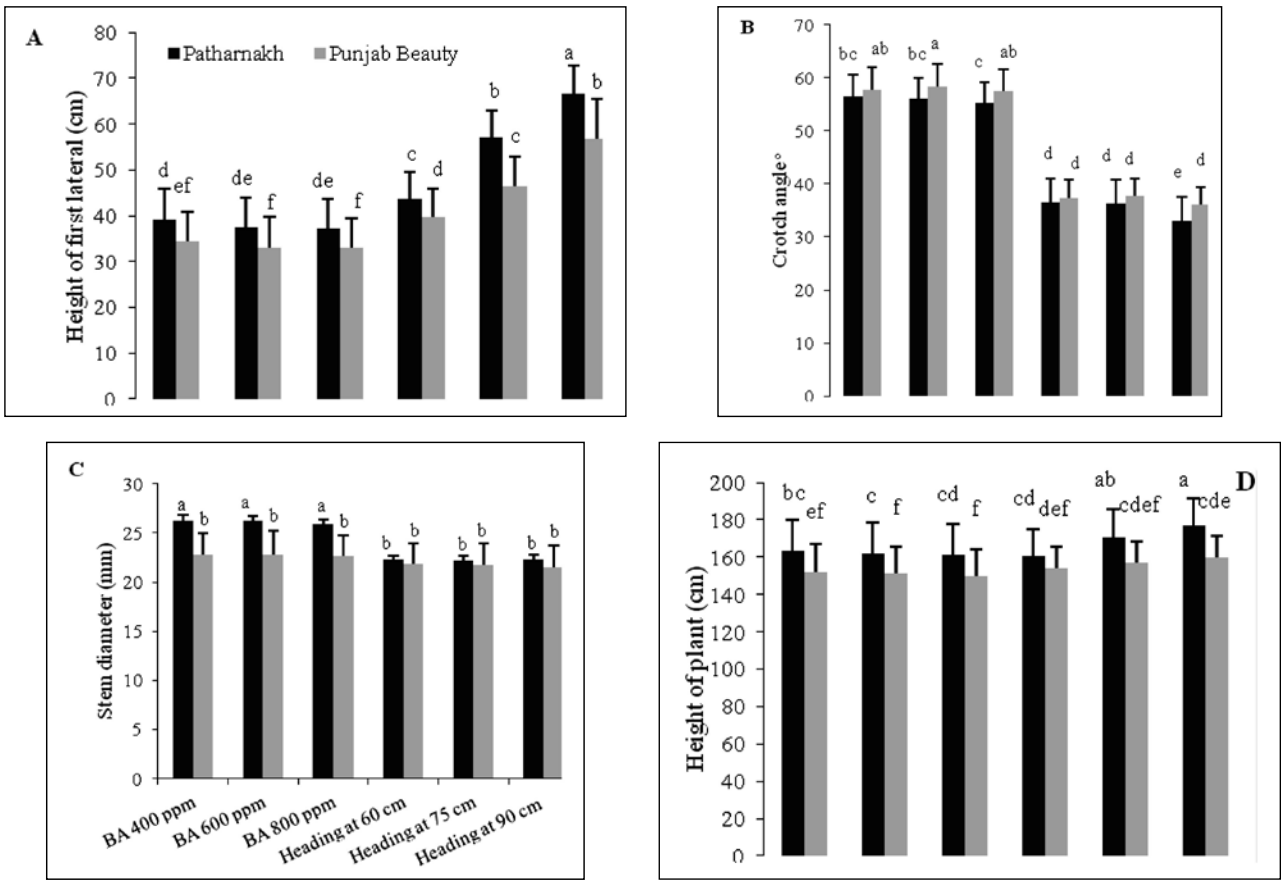


Fig. 1. Effect of BA and heading back treatments on total no of laterals/plant (A), number of laterals <50 (B), number of laterals >50 (C) and Total length of laterals (D) of cv. Patharnakh and Punjab Beauty. Vertical bars represent ±S.E. of means for 7 replications.

number of >50 cm shoots were recorded with BA applications than heading back treatments (fig 1C). The maximum (7.17 and 6.16) number of >50 cm shoots were recorded with BA 600ppm and BA 400 ppm treatments in cvs. Patharnakh and Punjab Beauty, respectively and minimum in control plants. BA treatments significantly increased the total length of laterals/plant as compared with heading back treatments and this effect was more apparent in cv. Patharnakh has compared to Punjab Beauty. The maximum total length of laterals for Patharnakh (765.80 cm) and Punjab Beauty (535.59 cm) was recorded with BA 600 ppm and BA 400 ppm treatments, respectively (fig 1D). Present findings are in accordance with the results obtained by Doric *et al* (2) who reported increased total feather length with BA applications. In both the cultivars, the initiation of the first lateral from the ground was at lowest level in BA 800 ppm treatment while control plants recorded higher initiation of first side shoot (fig 2A). Laterals were initiated at a lower level on the stem with BA treatments when compared to heading treatments. A significant variation in the crotch angle of laterals with the main axis was recorded with different treatments. The widest crotch angle of lateral in Punjab Beauty (58.37°) was noted with BA 600 ppm treatment but in Patharnakh maximum crotch angle (56.48°) was observed in BA 400ppm treatment. The control plants recorded the narrowest crotch angle of laterals (fig 2B). Similar to our studies, Steiner *et al*. (6) also reported that BA treatments resulted in greater obtuse crotch angle in apple nursery plants. The stem diameter was more in cv. Patharnakh than Punjab Beauty irrespective of treatment given. BA 600 ppm treated Patharnakh plants recorded significantly maximum (26.31 cm) stem diameter as compared to heading back treatment. However, in Punjab Beauty the stem diameter was not affected by any treatments (fig 2C). A similar increase in trunk diameter with BA applications was reported by Wertheim and Estabrooks (7). All the treatments had a significant effect on plant height (fig 2D). In both the cultivars, the control plant recorded maximum plant height in Patharnakh (176.94 cm) and Punjab Beauty (159.59 cm). BA applications significantly increased the plant spread as compared to heading back treatments. In cv. Patharnakh, maximum (42.32 cm) mean plant



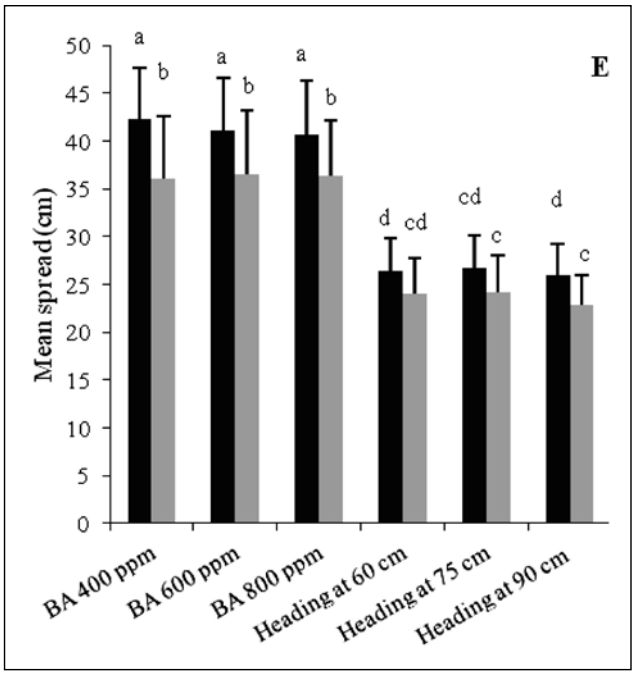


Fig. 2. Effect of BA and heading back treatments on height of first lateral (A), crotch angle ◦ (B), stem diameter (C), height of plant (D) and mean spread (E) of cv. Patharnakh and Punjab Beauty. Vertical bars represent ± S.E. of means for 7 replications.

spread was noticed in BA 400 ppm treatment while in Punjab Beauty, BA 600 ppm concentration recorded highest (36.59 cm) mean plant spread (fig 2E). In general, the spread of cultivar Patharnakh was greater than Punjab Beauty. The minimum spread of plants was observed under heading back treatments which may be attributed to narrow crotch angles of laterals. Similar results were reported by Doric *et al*. (1) who observed that BA has a stronger effect on the plant growth rate, resulting in a greater feather angle and spread of plants.

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