Performance of Cape gooseberry (*Physalis peruviana* L.) germplasm at differentdates of sowing in central Uttar Pradesh

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Summary of Thesis

The present investigation entitled "Performance of Cape gooseberry (*Physalis peruvian* L)"germplasm at different dates of sowing in central Uttar Pradesh" was conducted during rainy season May 2019- March 2020 and May 2020- March 2021. The details of methods and materials adopted during the experiments are described in this chapter. The investigation aimed to need of following objectives.

1 To standardize the optimum date of sowing in Cape gooseberry in central Uttar Pradesh for optimum yield and fruit quality in Awadh region.

2. To estimate the performance of Cape gooseberry germplasm at different dates of sowing for it vegetative growth parameters.
3. To study the performance of Cape gooseberry germplasm at different dates of sowing for yieldand yield attributing characters.
4. Microscopy studies for exploring variability in Cape gooseberry germplasm.

The present experiment was conducted at Department of Applied Plant Science (Horticulture) School for Bio-Sciences and Technology, Babasaheb Bhimrao Ambedkar University, Lucknow (U.P), during the two consecutive year 2019-20 and 2020-21. The experiment was laid out in split plot design with four sowing dates and five germplasm with 20 treatments combination. Observations were made on growth, yield and quality parameters. Others cultural practices like weeding, irrigation and disease management were common all treatments.

A. Vegetative growth and attribute:

Effect of different transplanting dates and germplasm on vegetative growths of Cape gooseberrygenotypes

1. The maximum (37and 35) number of seeds germinated was recorded in1st July under genotypes CITH CGB Sel.05 followed by (36 and 34) 1 July and minimum (20 and 22) was recorded under 1" May under genotypes CITH CGB Sel.02. Whereas, maximum (93and 88%) seed germination percentage was observed under CITH CGB Sel.05. While, minimum (50 and559%) was recordedunder 1stMay.
2. The maximum plant height (97.26cm) was observed in D_1xG_2 (15th June x Banaras) with the combined effect transplanting dates and germplasm after I80 days of transplanting.

While the least plant height (38.93cm) was recorded in D_4xG_1 (15^{th} September x Lucknow)

3. The maximum stem diameter (1.28cm) was recorded in D_1xG_1 (15^{th} June x Lucknow) with the combined effect of transplanting dates and germplasm after 180 days of transplanting, while the minimum stem diameter (0.74cm) was noted in (15^{th} September x CITH CGB Sel.05).

4. The maximum inter-nodal distance (5.15cm) was observed D_1xG_1 (15^{th} June x Lucknow) with the combined effect of transplanting dates and germplasm, while the minimum inter-nodal distance(3.55cm) was recorded in (15^{th} September x CITH CGB Sel.05).

5. The maximum number of primary branches (10.50) was noted in D_2xG_4 (15h of July x CITH CGB Sel.03) followed by D_1xG_4 (15^{th} June x CITH CGB Sel.03) and the minimum was recordedin (8.09) D_4xG_2 (15h September x Banaras).

6. The maximum number of leaves /branches (20.51) was noted in D_1xG_3 (15^{th} of June x CITH CGB Sel.02) followed by D_1xG_4 (15^{th} June x CITH CGB Sel.03), while the least number of leaves/branches (8.09) was recorded in D_4xG_2 (15^{th} September x Banaras).

7. The highest leaf length (5.9cm) was recorded in D_1xG_2 (15^{th} June x Banaras) at 180 days after transplanting, however the minimum leaf length (2.9cm) was recorded in D_4xG_4 (15^{th} September x CITH CGB Sel.03).

8. The maximum leaf breadth (4.2cm) was recorded in D_2xG_1 (15^{th} July x Lucknow) at 180 days after transplanting, however the minimum leaf breadth (2.1cm) was recorded in D_4xG_5 (15^{th} September x CITH CGB Sel.05).

9. The maximum canopy spread east- west (45.03cm) was recorded during both the years under treatment D_1xG_2 (15^{th} June x Banaras), while the minimum (21.40 cm) was recorded in D_4xG_1 (1 5^{th} September x Lucknow).

10. The maximum canopy spread north-south (39.03cm) was noted during both the years under treatment D_1xG_2 (15^{th} June x Banaras), while the minimum (18.21 cm) was recorded in D_4xG_4 (15^{th} September x CITH CGB Sel.03).

B. Flowering and fruiting attribute:

Effect of different transplanting dates and germplasm on flowering and fruiting ofCape gooseberry genotypes

1. The early transplanting have been take the maximum days to first flowering (108.01) was recorded under treatment D_2xG_2 (15^{th} July x Banaras), while the late transplanting take the early flowering (66.18) D_4xG_5 (15^{th} September x CITH CGB Sel.05) was recorded under the combinedeffect of transplanting dates and germplasm.

2. Early transplanting has been increased the number of flower per plant (123.03) was noted under the combined treatment D_1xG_3 (15^{th}June x CITH CGB Sel.02). However late transplantingdecreases the number of flower per plant (69.20) with the combined effect of D_4xG_3 (15^{th} September x CITH CGB Sel.02) in both year.

3. Transplanting on D_2xG_4 (15^{th} July x CITH CGB Sel.03) (88.57) have increased the number of fruit-set per plant, while the late transplanting (30.17) decreased the number of fruit set per plant with the combined effect of D_4xG_3 (15^{th} September x CITH CGB Sel.02) in both years.

4. Early transplanting has been increased the days taken fruit-set (6.3) was noted under treatmentD_1xG_2 (15^{th} June x Banaras), while transplanting on D_3xG_4 (15^{th} August x CITH CGB Sel.03) (5.8)reduced the days to taken fruit-set.

5. The early transplanting has been take the maximum days to first harvest (228.60) was recorded under treatment D_1xG_1 (15^{th} June x Lucknow), while the late transplanting decreases days to first

6. harvest (1 52.77) D_4xG_5 (15^{th} September x CITH CGB Sel.05) was recorded under the combined effect of transplanting dates and germplasm.

    a. **Effect of different transplanting dates on yield parameters of Cape gooseberry.**

7. The maximum yield (kg)/plant (0.95kg) was noted with treatment combination in D_2xG_3 (15^{th} July x CITH CGB Sel.02) in both years. While, the minimum (0.18kg/plant) was recorded with combined effect of D_4xG_3 (15^{th} September x CITH CGB Sel.02).

8. Similar trade was also observed in yield kg/plot (8.29kg/plot) with the combined effect of D_2xG_3(15^{th} July x CITH CGB Sel.02) in both years. While, the minimum (1.93kg/plot)

was recorded with combined effect of D_4xG_3 (15^{th} September x CITH CGB Sel.02).

9. The maximum yield (q/ha) (46.22q/ha) was noted with treatment combination in D_2xG_3 (15^{th} July x CITH CGB Sel.02) in both years. While, the minimum (10.80q/ha) was recorded with combined effect of D_4xG_3 (15^{th} September x CITH CGB Sel.02).

10. It was obvious that the early transplanting on (D_2) 15^{th} July has been increased the fruit yield Kg/plant, kg/plot and g/ha. Whereas, late transplanting on (D_4) 15^{th} of September has been decreased the fruit yield.

C. Effect of different transplanting dates on morphological study of Cape gooseberrygenotypes

1. The maximum fruit weight (10.66g) was observed with treatment combination in D_2xG_3 (15^{th}July x CITH CGB Sel.02) in both years. While, the minimum (5.11g) was recorded with combined effect of D_4xG_1 (15^{th} September x Lucknow) in both year.

2. The maximum fruit length (2.42cm) was recorded in D_2xG_2 (15^{th} July x Banaras) in both year followed by D_1xG_2 (15^{th} June x Banaras). However the minimum fruit length (2.19cm) was recorded with combined effect of D_4xG_1 (15^{th} September x Lucknow) in both year

3. The incensement of fruit diameter (2.66cm) was observed with treatment combination D_2xG_3 (15^{th}Julyx CITH CGB Sel.02) in both years. While least (2.22cm) was observed with combined effect of D_4xG_1 (15^{th} September x Lucknow) in both year.

4. The incensement of cheek diameter (2.55cm) was observed with treatment combination D_2xG_3(15^{th} July x CITH CGB Sel.02) in both years. While least (2.18cm) was observed with combined effect of D_4xG_1 (15^{th}September x Lucknow) in both year.

5. The maximum fruit volume (9.80cm) was observed with treatment combination D_2xG_3 (15^{th} July x CITH CGB Sel.02) in both years. While least (6.72cm) was observed with combined effectof D_4xG_1 (15^{th} September x Lucknow) in both year.

6. The maximum specific gravity (1.02cc/g) was observed with treatment combination D_3xG_5 (15^{th} August x CITH CGB Scl.05) in both years. While least (0.90cc/g) was observed with combined effect of D_4xG_1 (15^{th} July x Lucknow) in both year.

7. The maximum average fruit weight (0.054kg) was observed with treatment combination D_2xG_3 (15^{th} July x CITH CGB Sel.02) in both years. While minimum (0.026kg) was observed with combined effect of D_4xG_1 (15^{th} September x Lucknow) in both year.

D. Effect of different transplanting dates on quality attribute of Cape gooseberry genotypes

1. The maximum fruit juice percentage (63.89%) was recorded in treatment D_2xG_4 (15^{th} July x CITH CGB Sel.03) followed by D_2xG_3 (15^{th} July x CITH CGB Sel. 02), while minimum Juice percentage (52.63%) was recorded in D_4xG_3 (15^{th} September x CITH CGB Sel.02).

2. A Significant increased pH in fruit was found with 15^{th} July transplanting of (G_5) followed by D_3xG_5 (15^{th} August x CITH CGB Sel.05).The minimum fruit pH (3.9) with treatment combinationD_1xG_2 (15^{th} June x Banaras).

3. A significant increased T.S.S in fruit (14.94^0 Brix) was found with transplanting D_3xG_4 (15^{th} August x CITH CGB Sel.03) followed by D_3xG_5 (15lh August X CITH CGB Sel.05).Theminimum fruit T.S.S (14.30) with treatment combination D_1xG_2 (15^{th} June x Banaras).

4. A significant increased acidity % in fruit (1.12%) was found with transplanting D_3xG_5 (15^{th} August x CITH CGB Sel.05) followed by D_2xG_5 (15^{th} July X CITH CGB Sel.05).The minimum acidity% (1.00) with treatment combination D_4xG_2 (15^{th} September x Banaras).

5. The maximum total sugars percentage (6. 70%) was recorded in treatment D_2xG_5 (15^{th} July x CITH CGB Sel.05) followed by D_2xG_4 (15^{th} July x CITH CGB Sel.03), while total sugars percentage (6.24%) was recorded I in D_4xG_1 (15^{th} September x Lucknow).

6. The maximum reducing sugars percentage (3.33%) was recorded in treatment D_2xG_5 (15^{th} Julyx CITH CGB Sel.05) followed by D_2xG_4 (15^{th} July x CITH CGB Sel.03), while total sugars percentage (3.17%) was recorded in D_1xG_1 (15^{th} June x Lucknow).

7. The maximum non sugar percentage (3.26%) was recorded in treatment D_2xG_4 (15^{th} July x CITHCGB Sel.05) followed by D_2xG_4 (15^{th} July x CITH CGB Sel.03), while least non sugar percentage(3.10%) was recorded in D_1xG_1 (15^{th} June x Lucknow).

8. A significant increased ascorbic acidity% in fruit (46.25%) was found with transplanting.

D_2xG_4 (15th July x CITH CGB Sel.05) followed by D_2xG_4 (15th July X CITH CGB Sel.05).The minimum ascorbic acidity% (40.98%) with treatment combination D_4xG_1 (15th September x Lucknow).

9. A significant increased antioxidant % (80.04%) was found with transplanting D_2xG_4 (15th July x CITH CGB Sel.02) followed by D_1xG_2 (15th June x CITH CGB Sel.02).The minimum antioxidant (72.99%) with treatment combination D_4xG_1 (15 September x Lucknow).

10. A significant increased carotenoids mg/100g (1.40mg/100) was found with transplanting D_4xG_4 (15th September x CITH CGB Sel.03) followed by D_3xG_4 (15th August x CITH CGB Sel.03).The minimum carotenoids mg/100g was recorded with under treatment combination D_4xG_1 (15th September x Lucknow).

E. Scanning Electron Microscopy for exploring variability of Cape gooseberry germplasm at different transplanting dates.

1. A significant increased stomata length (25.18 µm) was found with transplanting D_2xG_3 (15th July x CITH CGB Sel.02) followed by D_1xG_2 (15th June x Banaras).The minimum stomata length (16.25 µm) was recorded with under treatment combination D_4xG_1 (15th September x Lucknow).

2. Maximum stomata width (204.9 µm) was recorded transplanting D_1xG_2 (15th June x Banaras) preceded by D_2xG_1 (15thJuly x Lucknow). The minimum stomata width (6.91 µm) was recorded under treatment D_4xG_3 (15th September x CITH CGB Sel.02).

3. Maximum stomata pore length (13.52 µm) was recorded transplanting D_3xG_1 (15th August x Lucknow) preceded by D_2xG_5 (15th July x CITH CGB Sel.05). The minimum stomata pore length (10.56 µm) was recorded under treatment D_4xG_1 (15th September x Lucknow).

4. Maximum stomata pore width (5.90 µm) was recorded transplanting D_2xG_2 (15thJuly x Banaras)preceded by D_1xG_4 (15th June x CITH CGB Sel.03). The minimum stomata pore width (3.54 µm)was recorded under treatment D_4xG_2 (1 5th September x Banaras).

5. Significantly increased trichome length (292.0 µm) was found with transplanting D_1xG_2 15th June x Banaras) followed by D_1xG_1 (15th June x Lucknow).The minimum trichome

length (222.54 µm) was recorded with under treatment combination D_4xG_2 (15th September x Banaras).

6. Significantly increased trichome width (53.52µm) was found with transplanting D_1xG_1 (15th June x Lucknow) followed by D_1xG_2 (15th June x Banaras).The minimum trichome width (37.03 µm) was recorded with under treatment combination D3xG2 (15th August x Banaras).

7. Maximum stomata density (201.33µm^{-1}) was recorded transplanting D_2xG_2 (15thJuly x Banaras) preceded by D_1xG_2 (15th June x Banaras).The minimum stomata density (65.80 µm^{-1}) was recordedunder treatment D_4xG_4 (15th September x CITH CGB Sel.03).

Conclusion

On the basis results obtained during the investigation, it is imperative to state that the germination percentage traits like number of seeds germinated, percent of seed germination and days taken to four-leaf stage were found under 1st July sowing date. Vegetative growth, flowering and fruiting and physico-chemical parameters were substantially, affected by various planting dates and germplasm of Cape goose berry. Vegetative growth with transplanting date 15th June D_1 showed the maximum vegetative growth. However, flowering, fruiting, yield and fruit quality attributes were found to be the best under D_2 (15th of July) transplanting and the maximum fruit yield was observed in G_4 (CITH CGB Sel.03) and fruit quality attributes were observed under germplasm CITH CGB Sel.02. In view of two years investigation, it can be summarized that early flowering and fruit maturity were found under September 15th transplanting and CITH CGB Sel.05 was observed as promising one among the germplasm Lucknow under the Lucknow condition.