Effect of varieties and spacing on growth, yield and quality of knol-khol (*Brassica oleracea* var. *gongylodes* L.)

SUMMARY

of

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SUMMARY OF THESIS

The current findings of the experiment entitled **"Effect of varieties and spacing on growth, yield and quality of knol-khol (*Brassica oleracea* var. *gongylodes* L.)"**conducted at Horticultural Research Farm-I, Departmentof Applied Plant Science (Horticulture), Babasaheb Bhimrao Ambedkar University (A Central University), Vidya-Vihar, Rae Bareli Road, Lucknow, (U.P.), India during *Rabi* season 2018-19 and 2019-20, respectively.The studies on vegetative growth, yield and quality. The most important aspects of the study reported and mentioned in the preceding chapters are described below.

Effect of varieties:

1. The maximum plant height (17.40 cm) at 30 DAT and (29.77 cm) at harvest was obtained under the treatment V_2 (White Vienna) followed by V_3 (Early White Vienna). While, the minimum plant height (15.93 cm) at 30 DAT and (27.36 cm) at harvest was noticed in V_1 (Pusa Virat).
2. The maximum number of leaves per plant was noticed in V_2 (White Vienna) (11.20) at 30 DAT and (18.89) at harvest followed by V_4 (Palam Tender Knob) while, the minimum leaves at 30 DAT (9.71) and at harvest (17.10) were recorded in V_1 (Pusa Virat).
3. The maximum length of leaf was noticed in V_2 (White Vienna) (11.20 cm) at 30 DAT and (24.56 cm) at harvest followed by V_4 (Palam Tender Knob) while, the minimum length of leaf (9.71 cm) at 30 DAT and (21.76 cm) at harvest was recorded in V_1 (Pusa Virat).
4. The maximum width of leaf was obtained in V_2 (White Vienna) (10.29 cm) at 30 DAT and (26.41 cm) at harvest followed by V_4 (Palam Tender Knob) while, the minimum width of leaf (8.65 cm) at 30 DAT and at harvest (22.94 cm) was obtained in V_1 (Pusa Virat).
5. The maximum spread of plant (29.92 cm) at harvest was noted in treatment V_4 (Palam Tender Knob) while, minimum spreadof plant (28.40 cm) at harvest was found in V_1 (Pusa Virat).
6. The maximum stem girth (11.37 cm) at harvest was obtained in V_1 (Pusa Virat) while, minimum stem girth (10.97 cm) at harvest was noted in V_2 (White Vienna).It was found statistically non-significant to all varieties.
7. The minimum days to knob initiation was obtained (34.83) under the treatment V_2 (White Vienna) while, maximum (37.54) days to knob initiation was obtained under the treatment V_4 (Palam Tender Knob). It was found statistically non-significant to all varieties.

8. The minimum days to knob harvest obtained (63.08) under the treatment V_1 (Pusa Virat) while, maximum (64.30) days to knob harvest was obtained under the treatment V_2 (White Vienna).It was found statistically non-significant to all varieties.
9. The maximum knob weight (221.14 g) was observed in treatment V_2 (White Vienna) followed by V_3 (Early White Vienna). While minimum knob weight (192.22 g) was noted in V_1 (Pusa Virat).
10. The highest knob diameter (5.55 cm) was recorded in V_2(White Vienna) followed by V_4 (Palam Tender Knob), while lowestvalues (4.48 cm) was noted in V_1 (Pusa Virat).
11. The highest knob volume (113.68 cc) was obtained in V_4 (Palam Tender Knob), which was noted to be considerablygreater as compared to rest of treatments but statistically similar with V_3 (Early White Vienna) while, minimum volume of knob (102.46 cc) was found under the treatment V_1 (Pusa Virat).
12. The maximum yield per plot (4.68 kg) was noticed in treatment V_2 (White Vienna) followed by V_3 (Early White Vienna). Whereashighest yield per plot (4.10 kg) was noted in V_1 (Pusa Virat).
13. The highest knob yield per ha (145.06 q) was recorded in variety V_2 (White Vienna) followed by V_3 (Early White Vienna) while minimum knob yield per ha (126.46 q) was noted in V_1 (Pusa Virat).
14. The maximum TSS content in knob (3.53 ^{0}Brix) was noted in treatment V_2 (White Vienna) followed by V_3 (Early White Vienna). While minimum TSS content in knob (2.83 ^{0}Brix) was recorded in V_1 (Pusa Virat).
15. The maximum vitamin C (37.26 mg/100g) was observed in treatment V_2 (White Vienna). While minimum vitamin C content (33.96 mg/100g) was obtained in V_1 (Pusa Virat).
16. The maximum reducing sugar content in knob (1.77 %) was noticed in treatment V_3 (Early White Vienna) followed by V_4 (Palam Tender Knob). While minimum reducing sugar content in knob (1.40 %) was noted in V_1 (Pusa Virat).
17. The maximum non-reducing sugar content in knob (0.69 %) was found in treatment V_4 (Palam Tender Knob) followed by V_2 (White Vienna). While minimum non-reducing sugar content in knob (0.54 %) was noted in V_1 (Pusa Virat).
18. The maximum total sugars content in knob (2.44 %) was recorded in treatment V_4 (Palam Tender Knob) followed by V_3 (Early White Vienna). While minimum total sugars content in knob (1.94 %) was noted in V_1 (Pusa Virat).

19. The maximum chlorophyll contents in plant leaves (0.71 mg/g) was recorded in treatment V_3 (Early White Vienna) followed by V_4 (Palam Tender Knob) at 45 DAT. However lowest chlorophyll contents in plant leaves (0.60 mg/g) was noted in V_1 (Pusa Virat).
20. The maximum gross returns (1.44290 Rs/ha) was noted in treatment V_2 (White Vienna) followed by V_3 (Early White Vienna) (1.41.011 Rs/ha). While minimum gross returns (1,25,926 Rs/ha) was noted in V_1 (Pusa Virat).
21. The maximum net returns (89,606 Rs/ha) was noted in treatment V_2 (White Vienna) followed by V_3 (Early White Vienna) (84,323 Rs/ha). While minimum net returns (69,125 Rs/ha) was noted in V_1 (Pusa Virat).
22. The maximum B:C ratio (1.57) was obtained in treatment V_2 (White Vienna) followed by V_3 (Early White Vienna) (1.48). While lowest B:C ratio (1.21) was noted in V_1 (Pusa Virat).

Effect of spacing:

1. The maximum plant height (18.00 cm) at 30 DAT and (31.22 cm) at harvest was found in S_4 (60 x 45 cm) while, the minimum plant height (15.50 cm) at 30 DAT and (27.23 cm) at harvest was noticed in S_1 (30 x 30 cm).
2. The maximum leaves per plant (11.68) at 30 DAT and (18.83) at harvest was obtained maximum under the treatment S_4 (60 x 45 cm) while, minimum number of leaves (9.77) at 30 DAT and (17.12) at harvest was recorded under the treatment S_1 (30 x 30 cm).
3. The maximum length of leaf (11.68 cm) at 30 DAT and (25.20 cm) at harvest was obtained under the treatment S_4 (60 x 45 cm) while, minimum length of leaf (9.77 cm) at 30 DAT and (22.65 cm) at harvest was found under the treatment S_1 (30 x 30 cm).
4. The maximum width of (10.76 cm) at 30 DAT and (26.44 cm) at harvest was obtained under the treatment S_4 (60 x 45 cm) while, minimum width of leaf (8.52 cm) at 30 DAT and (24.46 cm) at harvest was noted under the treatment S_1 (30 x 30 cm).
5. The maximum plant spread(30.96 cm) at harvest was found under the treatment S_4 (60 x 45 cm) while, minimum plant spread (27.98 cm) was recorded under the treatment S_1 (30 x 30 cm).
6. The maximum stem girth (11.35 cm) at harvest was recorded under the treatment S_4 (60 x 45 cm)while, minimum stem girth (11.04 cm) was found under the treatment S_1 (30 x 30 cm).
7. The minimum days to knob initiation (34.13) was obtained minimum under the treatment S_2 (45 x 30 cm)while, maximum (38.04) days to knob initiation was obtained under the treatment S_4 (60 x 45 cm).It was found statistically non-significant to all spacing.

8. The minimum days to knob harvest (62.98) was obtained under the treatment S_1 (30 x 30 cm)while, maximum (64.94) days to knob harvest was obtained under the treatment S_4 (60 x 45 cm). It was found statistically non-significant to all spacing.
9. The maximum weight of knob (229.91 g) was obtained maximum under the treatment S_4 (60 x 45 cm) while, minimum knob weight (191.76 g) was noted under the treatment S_1 (30 x 30 cm).
10. The highestknob diameter (5.81 cm) was noticed in the treatment S_4 (60 x 45 cm) followed by S_3 (45 x 45 cm) while the minimum diameter of knob (4.46 cm) was reported in S_1 (30 x 30 cm).
11. The highest knob volume (114.34 cc) was obtained in treatment S_4 (60 x 45 cm) while, minimum volume of knob (103.73 cc) was found under the treatment S_1 (30 x 30 cm).
12. The highest yield/plot (6.79 kg) was obtained in treatment S_1 (30 x 30 cm) while, minimum yield/plot (2.76 kg) was observedin treatment S_4 (60 x 45 cm).
13. The maximum knob yield (209.49 q/ha) was obtained maximum under the treatment S_1 (30 x 30 cm) while, minimum knob yield (85.03 q/ha) was found under the treatment S_4 (60 x 45 cm).
14. The maximum TSS content in knob (3.30 ^{0}Brix) was obtained maximum under the treatment S_3 (45 x 30 cm) while, minimum TSS content in knob (3.10 ^{0}Brix) was recorded under the treatment S_1 (30 x 30 cm).
15. The maximum ascorbic content in knob (36.76 mg/100g) was obtained maximum under the treatment S_2 (45 x 30 cm) while, minimum ascorbic acid content in knob (35.66 mg/100g) was noted under the treatment S_1 (30 x 30 cm).
16. The maximum reducing sugar content in knob (1.77 %) was obtained maximum under the treatment S_3 (45 x 45 cm) while, minimum reducing sugar content in knob (1.45 %) was observed under the treatment S_1 (30 x 30 cm).
17. The maximum non-reducing sugar content in knob (0.66 %) was obtained maximum under the treatment S_1 (30 x 30 cm) while, minimum non-reducing sugar content in knob (0.58 %) was recorded under the treatment S_3 (45 x 45 cm).
18. The maximum total sugars content in knob (2.35 %) was obtained maximum under the treatment S_4(60 x 45 cm) while, minimum total sugars content in knob (2.12 %) was found under the treatment S_1 (30 x 30 cm).
19. The maximum chlorophyll concentration in plant leaves (0.68 mg/g) at 45 DAT was obtained in treatment S_4 (60 x 45 cm) whereas, lower chlorophyll concentration in plant leaves (0.66 mg/g) was obtained in the treatment S_1 (30 x 30 cm).

20. The maximum gross returns (2,09,413 Rs/ha) was obtained under the treatment S_1 (30 x 30 cm) while, minimum gross returns (85,012 Rs/ha) was observed under the treatment S_4 (60 x 45 cm).
21. The maximum net returns (1,51,675 Rs/ha) was obtained maximum under the treatment S_1 (30 x 30 cm) while, minimum net returns (28,980 Rs/ha) was recorded under the treatment S_4 (60 x 45 cm).
22. The maximum B:C ratio (2.62) was noted maximum in the treatment S_1 (30 x 30 cm) however, lowest B:C ratio (0.52) was observedin the treatment S_4 (60 x 45 cm).

CONCLUSION

On the basis of results obtained in present investigation, it can be concluded that the effect of varieties and spacing on the growth, yield and quality of knol-khol was significantly. The White Vienna with spacing of 60 x 45 cm proved to be most effective in increasing the plant height, number of leaves, length of leaf, width of leaf, plant spread, weight of knob and volume of knob of knol-khol. While maximum yield, net returns and B:C ratio were obtained in White Vienna with spacing 30 x30 cm. In quality traits like total soluble solids, non-reducing sugar and total sugars were found maximum in Palam Tender Knobexcept reducing sugar and chlorophyll content. Hence, the variety White Vienna with 30 x 30 cm spacing may be suggested for higher crop production and can be recommended to farmers for successful cultivation of knol-khol (*Brassica oleracea* var. *gongylodes* L.) under Lucknow conditions.