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# Evaluation of ridge gourd hybrids for growth, yield and quality (*Luffa acutangula* L.)

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**Abstract**
The current study, titled "Evaluation of Ridge gourd hybrids for growth, yield and quality (*Luffa acutangula* L.)," was conducted from 2024 to 2025 at the Vegetable Research Farm, Department of Horticulture, SHUATS, Prayagraj. The experiment was laid out in a randomized block design (RBD) with 15 hybrids, each replicated three times. According to the experimental results from the current study, ridge gourd hybrid H14 (F1 Neha) had the maximum days to germination. The study found that the H13(Mangalam Hybrid seeds) had the highest vine length at last harvest, with the highest days taken to 50% female flowering was recorded in the H14 (F1Neha). The highest days taken to 100% female flowering was recorded in the H14 (F1Neha), while the highest average fruit weight was recorded in the H2 (New LU730). The highest fruit yield (kg/plant) and fruit yield (t/ha) was recorded in the H9 (SW 1211), and the highest TSS ($^{o}$brix) was recorded in the H9 (SW1211). The study concluded that these ridge gourd hybrids exhibited superiority in terms of growth, yield, and quality traits. The greatest B:C (1: 3.19) ratio was likewise recorded in the H9 (SW 1211) hybrid in Prayagraj agro-climate conditions.

**Keywords:** Growth, yield, quality, ridge gourd and hybrids

## Introduction
Ridge gourd, also known as ridged gourd or fluted loofah, is a popular Cucurbitaceous vegetable grown in India during the spring and summer seasons. It is one of the least expensive vegetables to produce and is cultivated on commercial scale and in kitchen gardens in countries like India, Indonesia, Malaysia, Myanmar, Philippines, Sri Lanka, and Taiwan. The crop is an annual, monoecious cross-pollinating vine plant with long taproot system, simple, sharply angled 5-lobed leaves, and dark green fruits with white pulp and black seeds embedded in spongy flesh.

India is the second largest producer of vegetables, producing 2.8% of the world's vegetables production in 2020. The current per capita availability of ridge gourd stands at approximately 145 grams, which falls short of the recommended daily intake of 300 grams. Additionally, its dried fruits have practical applications as natural bath sponges, scrub pads, doormats, mattress filling, pillows, and even for cleaning kitchen utensils. They contain a gelatinous compound known as luffein, which exhibits abortifacient, antitumor, ribosome-inactivating, and immunomodulatory properties.

Ridge gourd requires a long warm season for best production and grows best during the rainy season. The optimal temperature requirement for these crops is 250-270 C. Both pistillate and staminate flowers can be found within the same axil, with anthesis beginning in the evening and the flowers remaining open overnight.

The fruits typically measure between 15 to 30 cm in length, have a cylindrical or club-like shape, and are characterized by ten distinct, wing-like ridges. They contain edible protein (82%), moisture (92.5 g), protein (0.5 g), fat (0.5 g), carbohydrates (3.4 g), energy (17 kcal), calcium (18 mg), vitamin C (5 mg), riboflavin (0.01 mg), phosphorous (26 mg), iron (0.5 mg), and carotene 33 µg per 100 g of edible portion. The seeds of ridge gourd are typically flattened and range from 10 to 12 mm in length. They appear white in immature fruits and turn black as the fruit ripens. The purgative, anthelmintic, and emetic properties of the plant are primarily attributed to the presence of the secondary metabolite cucurbitacin. The seeds contain Ribosome Inactivating proteins (RIPs) and luffaculin, which have various

pharmacological activities such as abortifacient, antifungal, antitumor, antivirus, and HIV-1 integrase inhibitory properties.

Ridge gourd presents significant potential for the commercial exploitation of hybrid vigour, as the high number of hybrid seeds per cross makes $F_1$ seed production more economical. The incorporation of male sterility significantly improves the efficiency and economic feasibility of large-scale hybrid seed production.

## Materials and Methods

The present investigation, titled "Evaluation of Ridge gourd Hybrids for Growth, Yield and Quality (*Luffa acutangula* L.)," was carried out at the Vegetable Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (Uttar Pradesh) during 2024–2025. The study aimed to assess the growth performance, yield potential, and quality characteristics of different ridge gourd hybrids. This chapter provides detailed information on the materials and methods employed during the course of the investigation.

## Results and Discussion

The present investigation entitled "Evaluation of Ridge gourd hybrids for growth, yield and quality (*Luffa acutangula* L.)" was carried out at vegetable Research Farm, Department of Horticulture, Naini Agricultural institute, The study was conducted at Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.) in 2024.The results obtained during the course of this with the help of tables, plates and illustrated graphically as well as in the appendix data on various parameter studied were subjected to statistical analysis in order to draw the valid conclusions of results, which were been interpreted in succeeding page.

**Table 1:** List of the of ridge gourd hybrids used in the Experiment:

| Hybrids | Name of the hybrids | Sources |
|---|---|---|
| H1 | TMRG1509 | Trimurti Seeds Pvt. Ltd |
| H2 | New LU730 | Trimurti Seeds Pvt. Ltd |
| H3 | Nisha | Ramnagar seed Farm pvt. Ltd. |
| H4 | KSP 1501 Anu | Kalash Seeds Pvt. Ltd. |
| H5 | USM – KUMBH | UNISEM Agritech Pvt. Ltd., Bangalore |
| H6 | USM – SUNITA | UNISEM Agritech Pvt. Ltd. |
| H7 | AARTI | VNR Seeds Pvt. Ltd. |
| H8 | NHRG- 1001 | Nuziveedu Seeds Ltd. |
| H9 | SW 1211 | Seed works International Pvt. Ltd |
| H10 | Leadbeter | Leadbeter seeds Pvt. Ltd |
| H11 | Jaipuri Long | Tycoon seedtech Pvt. Ltd |
| H12 | Rekha | R.K. Seed farms (REGD) |
| H13 | Mangalam Hybrid seeds | Verito Hybrid seeds Co. |
| H14 | F1 Neha | Aadya Seeds Pvt. Ltd |
| H15 | F1 Malti | Indo Tokyo Hybrid Seeds |

### Growth Parameters

#### Days to Germination

The maximum days to germination was (8.20) recorded in H14 (F1 Neha), followed by H9 (SW 1211), while the minimum days to germination of ridge gourd was recorded in H12 (Rekha) with (6.30). A similar study on ridge gourd seeds reported that pre-germinated seeds led to faster and more uniform germination, along with improved seedling emergence (Thirusenduraselvi and Jerlin, 2010) [13].

#### Vine length at last harvest (cm)

The maximum Vine length (cm) at harvest was (223.10) recorded in H13 (Mangalam Hybrid seeds), followed by H11 (Jaipuri Long), while the minimum Vine length (cm) at harvest of ridge gourd was recorded in H3 (Nisha) with (213.20). This happens due to the stimulation of cellular expansion and cell division more by H13 (Mangalam Hybrid) hybrid than other hybrids under field conditions. Similar results were reported by Reddy *et al*. (2019) [12] and Triveni *et al*. (2020) [14]. Also, A longer vine length in ridge gourd at harvest generally indicates better plant health and growth, potentially leading to higher fruit yield and quality. Factors such as fertilizer application and the use of plant growth regulators can significantly affect vine length and, in turn, overall plant performance, as also reported by Krishnamoorthy and Ananthan (2017) [8] and Triveni *et al*. (2020) [14].

#### Number of lateral branches per plant

The maximum Number of lateral branches per plant was (6.67) recorded in H9 (SW1211), followed by H15 (F1 Malti), while the minimum Number of lateral branches per plant of ridge gourd was recorded in H14 (F1Neha) with (5.89). Apical dominance, a natural phenomenon where the main stem's growth inhibits the growth of lateral branches, plays a significant role. Removal of the apical bud (the main shoot tip) reduces auxin, the plant hormone responsible for apical dominance, allowing lateral branches to develop. Present findings were in line with Bhargava *et al*. (2017) [2] reported 4.25 primary branches for ridge gourd hybrid NDRG-10. A comparable trend was observed in the study conducted by Harshitha *et al*. (2019) [4].

### Flowering Parameters

#### Days taken to 50% female flowering

The maximum Days taken to 50% female flowering was (28.44) recorded in H14 (F1 Neha), followed by H15 (F1 Malti), while the minimum Days taken to 50% female flowering of ridge gourd was recorded in H14 (USM-SUNITA) with (26.11). The number of days taken to 50% female flowering in ridge gourd is influenced by a variety of factors, including plant growth, environmental conditions. The reason for the number of days taken to 50% female flowering in ridge gourd it was earliest to open first male flower (26.11 days) and these results are in analogous with reports of Rathore *et al*. (2017) [11] and Yadav *et al*. (2017) [15].

**Days taken to 100% female flowering**

The maximum Days taken to 100% female flowering was (37.66) recorded in H14 (F1 Neha), followed by H8 (NHRG-1001), while the minimum Days taken to 100% female flowering of ridge gourd was recorded in H2(NewLU730) with (35.11). Different ridge gourd varieties exhibit varying flowering times and overall plant vigor, which can influence the time to 100% female flowering. These results were parallel to the research outlines of Kandasamy *et al*. (2019) [7], Triveni *et al*. (2020) [14].

**Days taken to 50% harvest**

The maximum Days taken to 50% harvest was (43.89) recorded in H10 (Leadbeter), followed by H12(Rekha), while the minimum Days taken to 50% harvest of ridge gourd was recorded in H11(Jaipuri Long) with (42.78). The number of days taken for 50% harvest in ridge gourd is a crucial factor for efficient farming practices and yield optimization. Several factors influence this, including climate, soil type, variety of ridge gourd, and overall plant health. Comprehending these factors is vital to achieving high yield and superior fruit quality. These results were parallel to the research outlines of Kandasamy *et al*. (2019) [7], Triveni *et al*. (2020) [14].

**Days taken to 100% harvest**

The maximum Days taken to 100% harvest was (57.77) recorded in H11 (Jaipuri Long), followed by H5 (USM-KUMBH), while the minimum Days taken to 100% harvest of ridge gourd was recorded in H12(Rekha) with (54.66). Several factors influence this, including climate, soil type, variety of ridge gourd, and overall plant health. Grasping these factors is essential for improving harvest outcomes and ensuring high-quality fruits. These results were parallel to the research outlines of Kandasamy *et al*. (2019) [7], Triveni *et al*. (2020) [14].

**Table 1:** Mean Performance of different hybrids of Ridge gourd on growth and flowering parameter

| Hybrids | | Days to Germination | Vine length (cm) at last harvest | Number of lateral branches per plant | Days taken to 50% female flowering | Days taken to 100% female flowering | Days taken to 50% harvest | Days taken to 100% harvest |
|---|---|---|---|---|---|---|---|---|
| H1 | TMRG1509 | 7.43 | 222.43 | 6.00 | 27.55 | 36.33 | 43.44 | 56.33 |
| H2 | New LU730 | 7.63 | 216.73 | 6.00 | 27.44 | 35.11 | 43.22 | 56.11 |
| H3 | Nisha | 6.63 | 213.20 | 6.22 | 27.44 | 35.55 | 43.55 | 56.00 |
| H4 | KSP 1501 Anu | 7.07 | 216.97 | 6.00 | 27.22 | 36.00 | 43.33 | 56.66 |
| H5 | USM – KUMBH | 7.07 | 217.30 | 6.44 | 27.77 | 35.88 | 43.22 | 57.00 |
| H6 | USM – SUNITA | 7.30 | 220.13 | 6.33 | 26.11 | 36.55 | 43.33 | 56.44 |
| H7 | AARTI | 7.07 | 222.43 | 6.00 | 27.33 | 36.44 | 43.00 | 55.11 |
| H8 | NHRG- 1001 | 6.60 | 213.87 | 6.44 | 27.44 | 37.11 | 43.11 | 56.33 |
| H9 | SW 1211 | 7.97 | 213.77 | 6.67 | 27.11 | 36.11 | 43.66 | 56.44 |
| H10 | Leadbeter | 7.63 | 216.33 | 6.00 | 26.44 | 35.44 | 43.89 | 56.77 |
| H11 | Jaipuri Long | 7.17 | 222.77 | 6.22 | 28.22 | 35.22 | 42.78 | 57.77 |
| H12 | Rekha | 6.30 | 220.37 | 5.89 | 27.11 | 35.44 | 43.44 | 54.66 |
| H13 | Mangalam Hybrid seeds | 7.20 | 223.10 | 6.22 | 26.66 | 36.33 | 43.33 | 55.78 |
| H14 | F1 Neha | 8.20 | 215.00 | 5.89 | 28.44 | 37.66 | 43.00 | 56.55 |
| H15 | F1 Malti | 6.83 | 220.03 | 6.55 | 28.33 | 35.55 | 43.44 | 55.22 |
| F- test | | S | S | S | S | S | NS | S |
| SE(m) | | 0.351 | 1.126 | 0.164 | 0.457 | 0.487 | 0.425 | 0.493 |
| C. D. (P = 0.05) | | 0.725 | 2.324 | 0.338 | 0.943 | 1.006 | 0.876 | 1.017 |
| C.V. | | 0.025 | 0.254 | 0.005 | 0.042 | 0.048 | 0.036 | 0.049 |

**Yield Parameters**

**Average fruit weight (g)**

The maximum Average fruit weight (g) was (109.11) recorded in H2 (New LU730), followed by H4(KSP 1501 Anu), while the minimum Average fruit weight (g) of ridge gourd was recorded in H9 (SW 1211) with (90.77). However, this can vary significantly based on factors like variety, growing conditions, and maturity at harvest. Nutrient availability, water supply, and other environmental factors can impact fruit weight. The present findings align with those reported by Harshitha *et al*. (2019) [4]. Krishnamoorthy and Durga *et al*. (2021) [8].

**Number of fruits /plants**

The maximum Number of fruits per plant were (11.11) recorded in H9 (SW 1211), followed by H1(TMRG1509), while the minimum Number of fruits per plant of ridge gourd was recorded in H2(New LU730) with (7.77). The number of fruits per ridge gourd plant is influenced by various factors, including plant vigor, nutrient availability, water management, and pollination success. A well-nourished plant, with proper irrigation and pollination, can produce a higher number of fruits. Healthy, strong plants with good vegetative growth are more likely to produce a higher number of fruits. These results are consistent with the findings of Harshitha *et al*. (2019) [4], Krishnamoorthy and Ananthan (2017) [8] and Durga *et al*. (2021).

**Fruit length (cm)**

The maximum Fruit length (cm) was (22.37) recorded in H9 (SW 1211), followed by H5(USM – KUMBH), while the minimum Fruit length(cm) of ridge gourd was recorded in H12(Rekha) with (17.90). The Fruit length ridge gourd plant is influenced by various factors, including plant vigor, nutrient availability, water management, and pollination success. A well-nourished plant, with proper irrigation and pollination, can produce a higher number of fruits. Healthy, strong plants with good vegetative growth are more likely to produce a higher number of fruits. These results are similar with findings by Harshitha *et al*. (2019) [4], Krishnamoorthy and Ananthan (2017) [8] and Durga *et al*. (2021).

**Fruit diameter (cm)**

The maximum Fruit diameter (cm) was (6.84) recorded in H6 (USM – SUNITA), followed by H7(AARTI), while the minimum Fruit diameter (cm) of ridge gourd was recorded in H11(Jaipuri Long) with (4.81). The increased fruit length may be attributed to hybrid vigour and the variety's adaptability to the agroclimatic conditions of Allahabad. Mishra *et al*. also documented similar observations in their study. (2019) [10], Kumar, S *et al*. (2018) [9] also reported more or less similar results in Bitter gourd.

**Fruit yield (kg/plant)**

The highest fruit yield (4.78 kg/plant) was recorded in H9 (SW 1211), followed by H1 (TMRG1509). In contrast, the lowest yield (3.28 kg/plant) was observed in H7 (AARTI). Increasing of number of fruits per plant is mostly influenced by genetic factor, environmental factor, hormonal factor and vigour of the crop. The number of fruits borne by each plant plays a vital role in determining the crop's productivity. The Similar findings were previously reported by Kumar Sushil, *et al*. (2018) [9], Husna, A *et al*. (2011) [5].

**Fruit yield (t/ha)**

The highest fruit yield (10.78 t/ha) was recorded in H9 (SW 1211), followed by H1 (TMRG1509), while the lowest yield (8.20 t/ha) was observed in H7 (AARTI).The higher yield (t/ha) may be attributed to the hybrid's inherent traits, better adaptability to environmental conditions, and efficient utilization of available resources such as water, nutrients, light, and $CO_2$. However, none of the treatments had a significant effect on plant stand. the Similar findings were previously reported by Kumar, K *et al*. (2018) [9], Husna, A *et al*. (2011) [5].

**Quality Parameters**

**Total soluble solids (ºBrix)**

The maximum TSS (ºBrix) were (4.4) recorded in H9 (SW 1211), followed by H13(Mangalam Hybrid seeds), while the minimum TSS (ºBrix) of ridge gourd was recorded in H3(Nisha) with (3.40). The Total Soluble Solids (TSS), measured as (ºBrix) in ridge gourd is due to the accumulation of metabolites, which can stimulate enzyme activity and the conversion of starch into sugar. Factors like plant growth regulators can also influence TSS, potentially by stimulating metabolic pathways that increase the production of sugars and other soluble solids. Additionally, increased leaf area and photosynthetic activity can lead to more assimilate availability for the developing fruits, resulting in higher TSS. Similar observations were made in the studies conducted by Aruna and Swaminathan *et al*. (2012) [1], Harika *et al*. (2012) [3] and Iqbal, M *et al*. (2018) [6].

**Table 2:** Mean Performance of different hybrids of ridge Gourd on Yield and Quality parameters

| Hybrids | | Average fruit weight (g) | Number of fruits /plants | Fruit length (cm) | Fruit diameter (cm) | Fruit yield (kg/plant) | Fruit yield (t/ha) | Total soluble solids (ºBrix) |
|---|---|---|---|---|---|---|---|---|
| H1 | TMRG1509 | 103.59 | 10.33 | 18.63 | 5.62 | 4.35 | 10.70 | 3.66 |
| H2 | New LU730 | 109.11 | 7.77 | 20.10 | 6.27 | 3.39 | 8.48 | 3.80 |
| H3 | Nisha | 97.25 | 10.00 | 19.60 | 4.98 | 3.89 | 9.72 | 3.40 |
| H4 | KSP 1501 Anu | 105.44 | 10.22 | 21.10 | 5.56 | 4.03 | 10.08 | 4.10 |
| H5 | USM – KUMBH | 104.88 | 9.11 | 21.87 | 5.06 | 3.82 | 9.55 | 3.90 |
| H6 | USM – SUNITA | 102.50 | 8.11 | 19.47 | 6.84 | 3.32 | 8.31 | 3.50 |
| H7 | AARTI | 91.06 | 9.00 | 20.13 | 6.36 | 3.28 | 8.20 | 4.20 |
| H8 | NHRG- 1001 | 99.94 | 9.77 | 19.43 | 5.07 | 3.90 | 9.76 | 3.50 |
| H9 | SW 1211 | 90.77 | 11.11 | 22.37 | 5.20 | 4.78 | 10.78 | 4.40 |
| H10 | Leadbeter | 104.33 | 9.89 | 20.53 | 5.04 | 4.01 | 10.32 | 3.60 |
| H11 | Jaipuri Long | 105.28 | 9.55 | 20.97 | 4.81 | 4.02 | 10.05 | 4.10 |
| H12 | Rekha | 100.33 | 9.77 | 17.90 | 4.99 | 3.92 | 9.80 | 4.20 |
| H13 | Mangalam Hybrid seeds | 97.94 | 8.89 | 18.63 | 5.38 | 3.48 | 8.71 | 4.30 |
| H14 | F1 Neha | 99.89 | 8.78 | 21.27 | 5.75 | 3.51 | 8.77 | 3.50 |
| H15 | F1 Malti | 92.25 | 9.44 | 19.90 | 4.97 | 3.48 | 8.70 | 3.80 |
| F- test | | S | S | S | S | S | S | S |
| SE(m) | | 2.582 | 0.271 | 0.683 | 0.272 | 0.204 | 0.228 | 0.069 |
| C. D. (P = 0.05) | | 5.329 | 0.56 | 1.409 | 0.561 | 0.421 | 0.47 | 0.142 |
| C.V. | | 1.333 | 0.015 | 0.093 | 0.015 | 0.008 | 0.01 | 0.001 |

**Economics analysis**:

Economics of all hybrids were calculated according to the expenditure occurred from the raising till harvesting of fruits *viz*. Cost of cultivation, gross return, net return, and benefit cost ratio has been worked out for 15 hybrids. Maximum gross return was recorded of (247940 $ha^{-1}$) was obtained from the hybrid H9 (SW 1211), followed byH10 (Leadbeter) (237360 $ha^{-1}$) and so on. Maximum net return was recorded of (170320 $ha^{-1}$) was obtained from the hybrid H9 (SW 1211), followed byH10 (Leadbeter) (159625 $ha^{-1}$) and so on. Maximum B:C ratio was recorded of (1: 3.19) was recorded from the hybrid H9 (SW 1211), followed by byH10 (Leadbeter) (1:3.05) and so on.

**Table 3:** Benefit cost ratio of different hybrids of ridge gourd

| Hybrids | Cost of cultivation (Rs/ha) | Total yield (t/ha) | Selling Rate (Rs/ha) | Gross return (Rs/ha) | Net return (Rs/ha) | Benefit cost ratio |
|---|---|---|---|---|---|---|
| H1 | 77590.00 | 10.7 | 23000 | 246100 | 168510 | 2.17 |
| H2 | 77605.00 | 8.48 | 23000 | 195040 | 117435 | 2.51 |
| H3 | 77660.00 | 9.72 | 23000 | 223560 | 145900 | 2.88 |
| H4 | 77580.00 | 10.08 | 23000 | 231840 | 154260 | 2.99 |
| H5 | 77590.00 | 9.55 | 23000 | 219650 | 142060 | 2.83 |
| H6 | 77600.00 | 8.31 | 23000 | 191130 | 113530 | 2.46 |
| H7 | 77648.00 | 8.2 | 23000 | 188600 | 110952 | 2.43 |
| H8 | 77535.00 | 9.76 | 23000 | 224480 | 146945 | 2.90 |
| H9 | 77620.00 | 10.78 | 23000 | 247940 | 170320 | 3.19 |
| H10 | 77735.00 | 10.32 | 23000 | 237360 | 159625 | 3.05 |
| H11 | 77580.00 | 10.05 | 23000 | 231150 | 153570 | 2.98 |
| H12 | 77542.00 | 9.8 | 23000 | 225400 | 147858 | 2.91 |
| H13 | 77500.00 | 8.71 | 23000 | 200330 | 122830 | 2.58 |
| H14 | 77585.00 | 8.77 | 23000 | 201710 | 124125 | 2.60 |
| H15 | 77580.00 | 8.7 | 23000 | 200100 | 122520 | 2.58 |

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## Conclusion
The results of the present investigation indicated that the ridge gourd hybrids H9 (SW 1211), H11 (Jaipuri Long), and H14 (USM-SNITA) were identified as superior in terms of growth, yield and quality. In terms of economic maximum gross return, net return and B:C ratio was recorded in hybrid H9 (SW1211). However, since these results are based on one season experiment therefore further trials for testing of adaptability and stability may be substantiated the results and can be used for commercial exploitation.

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