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Demonstrations plot study for yield and economic evaluation of little gourd (GNLG-1) and pointed gourd (GNPG-1) varieties

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Abstract
The Demonstration Plot Study, for GNLG-1 variety showed a 17.18% increase in yield (133.00 q/ha) compared to check plots (113.50 q/ha), with a potential yield of 156.00 q/ha. The GNPG-1 variety exhibited a 15.74% yield increase (136.00 q/ha) compared to check plots (117.50 q/ha), with a potential yield of 160.00 q/ha. Economic analysis revealed favourable outcomes. For GNLG-1, gross cost was 1,68,000 Rs./ha, yielding a net return of 1,24,600 Rs. and a BC ratio of 1.74 resulted in 35.88% net return increase. GNPG-1 demonstrated a gross cost of 1,65,000 Rs./ha, yielding a net return of 1,75,000 Rs. and a BC ratio of 2.06. Demonstrations led to a 30.84% net return increase for GNPG-1 and highlighted the economic advantage of adopting scientific approaches, resulting in additional returns of 32,900 Rs. for GNLG-1 and 41,250 Rs. for GNPG-1.

Keywords: Demonstration plot, little gourd, pointed gourd

Introduction
The Little gourd and Pointed gourd are vine-based vegetables that are extensively cultivated across India and belong to the Cucurbitaceae family. The Little gourd, known as "kundru" or "tindora," has its origins in India and holds significant economic and nutritional value due to its widespread cultivation. It is not only cultivated in India but also in regions like Burma and Southeast Asia. Additionally, it finds its presence in countries such as tropical Africa, Central America, China, Malaysia and other tropical areas. There are a total of 30 global species of Little gourd, primarily concentrated in Africa. Notably, only one species, *Coccinia indica* (synonymous with *Coccinia cordifolia* and *Ciphlandra indica*), is cultivated and naturally occurring in both India and tropical Africa (Pandey *et al*., 2020) [11]. The fruits of this gourd are used in culinary preparations and also possess medicinal properties, being employed for treating skin infections, bronchitis, and diabetes. Its young plant parts, rich in vital nutrients such as iron, vitamin A, and vitamin C, are also used in cooking. A remarkable feature is that while the plant has male and female variants, female plants are capable of producing fruits without the need for male pollination, making cultivation more streamlined for farmers.
Trichosanthes dioica Roxb., commonly known as pointed gourd or parwal, is a perennial cucurbitaceous plant native to the Indian subcontinent. Also referred to as the "green potato," it holds a significant place as a favored vegetable with a long history in Indian cuisine. The Trichosanthes genus, with about 44 species, of which 22 are found in India, is of Indo-Malayan distribution. The name "petola" or "patala," used to refer to snake gourd (*Trichosanthes cucumerina*) in the Malay Peninsula and Philippine islands, has its origins in Sanskrit ("patola"), suggesting that the *Trichosanthes* genus might be indigenous to India. Two cultivated species within this genus are *Trichosanthes anguina* and *Trichosanthes dioica* (Pandey *et al*., 2020) [11]. It is extensively cultivated across Asiaand Australia, with a notable presence in various parts of India, where it goes by names like parmalin, palwal, and potol. The plant thrives in diverse regions, including eastern India and the northern plains spanning from Punjab to Assam, Bihar, West Bengal and Odisha. Originating primarily from the Assam region, its cultivation spans an estimated 10,000 hectares in India, predominantly in Diara lands.
The pointed gourd is characterized by its distinctive features, including a dioecious growth pattern and robust vine development. Its dark green, heart-shaped leaves stand in contrast to its tuberous roots and tubular white flowers. The fruits, often globular or oblong with unique

stripes, contain globose seeds. In terms of nutritional content, the pointed gourd outperforms other cucurbitaceous vegetables, boasting elevated levels of vitamins A and C, along with essential minerals like magnesium, potassium and phosphorus (Suresh Babu *et al*., 2001) [6]. With high protein content and low levels of cholesterol and fat, it holds nutritional value. Apart from its culinary role, the immature fruits are consumed as vegetables and young leaves are utilized as nutritious leafy greens. These components find use in pickles, confectioneries, curries and fried dishes.

From a medicinal perspective, the pointed gourd holds a prominent place in Ayurvedic practices, addressing various conditions such as bronchitis, fever, and skin ailments. It serves as a diuretic, laxative, and cardio tonic agent, effectively balancing bile and addressing cough. Moreover, it contributes to diabetes management, skin ailment treatment and blood purification. Its diverse applications even encompass traditional remedies for jaundice, viral infections, flu, anaemia and gastritis, showcasing its versatility. Flavonoids and trace elements present in the plant contribute to its anti-diabetic properties.

Notably, a cultural practice for both of these crops is pruning, such as the winter trimming of vines by approximately 15 centimetres from the ground. This practice supports robust growth and is employed by farmers in South Gujarat. These pruned plants give rise to new growth in the month of February, providing a yield up to November.

In the realm of horticulture, South Gujarat assumes a pivotal role, earning the region the nickname "bowl of horticultural crops" (Gurjar *et al*., 2023) [4]. The Navsari district features medium black soil and a warm climate (Gurjar *et al*., 2022, 2023) [3, 5], making it highly suitable for vine-based vegetables. However, the cultivation of these crops is restricted around cities and coastal areas (Swamy K.R.M.)[7]. In Gujarat, South Gujarat leads in productivity for cultivating these vine vegetables, particularly in Dangs, Navsari, Valsad and Tapi districts. Furthermore, the GNLG-1 variety demonstrates superiority over anthracnose, powdery mildew and vine borers compared to local varieties. The cultivation of improved varieties of pointed gourd (released in 2014) and Little gourd released in 2012 by Navsari Agricultural University can bring numerous benefits to farmers in terms of increased yield, quality, market demand, and sustainability. Thus, a front-line demonstration is organized with the following objectives:

1. To assess the impact of new varieties on crop yield and overall productivity.
2. To evaluate the adaptability of these varieties to dynamic climate conditions.
3. To analyse the economic implications of cultivating these new varieties.

Materials and Methods

The Krishi Vigyan Kendra (KVK) in Navsari conducted practical Front-Line Demonstrations (FLDs) to promote scientific cultivation techniques for two varieties: Gujarat Navsari Little Gourd 1 (GNLG-1) and Gujarat Navsari Pointed Gourd 1 (GNPG-1). Both varieties were planted at a spacing of 2 x 1 meters. These FLDs were strategically carried out during the summer of 2022-23 in fields located in Tribal areas of Vansda and Khergam block of Navsari district. A total of 20 FLDs covering 0.40 hectares were dedicated to GNLG-1, while 10 FLDs covering 0.22 hectares were allocated for GNPG-1. The FLDs followed stringent guidelines for site selection and farmer involvement, in accordance with the recommendations of Choudhary (1999) [1]. Farmers were identified through surveys and consultations and subsequent training sessions were conducted at the KVK campus to impart scientific cultivation practices and optimal plant protection measures (Gurjar *et al*., 2023) [4].

To ensure optimal growth, farmers were provided guidance on fertilizer and organic manure application, including a recommended dosage of 120-60-40 kg NPK/ha for Pointed gourd and 100-50-50 kg NPK/ha for Little gourd along with 10 t/ha of well-rotted farmyard manure (FYM) to each crop. Additionally, fruit fly traps were recommended as fruiting commenced. Local traditional methods were maintained in check plots to ensure consistency with local practices (Gurjar *et al*., 2022 and 2023) [4, 5].

The economic feasibility evaluation involved calculating the Benefit-Cost (BC) ratio based on data collected from the demonstration plots, including yields and production expenses. The effectiveness of the FLDs was assessed using technology gap, extension gap, and technology index calculations, following the methodologies endorsed by Eswaraprasad *et al*. (1993) [2] and Samui *et al*. (2000) [7]. The formulas for these measurements are as follows:

1. Extension Gap = Demonstration Yield – Farmer Yield
2. Technology Gap = Potential Yield – Demonstration Yield
3. Technology Index = (Technology Gap / Potential Yield) * 100
4. Increase in Yield % = ((Demonstration Yield – Farmer Yield) / Farmer Yield) * 100

Results and Discussion

For the GNLG-1 variety, the demonstration plots achieved an average yield of 133.00 quintals per hectare (q/ha), marking a 17.18% increase compared to the check plots yielding 113.50 q/ha. The potential yield for this variety is 156.00 q/ha, resulting in an extension gap of 19.50 q/ha and a technology gap of 23.00 q/ha. The technology index was 14.74%.

Similarly, the GNPG-1 variety demonstrated a 15.74% yield increase in the demonstration plots, yielding 136.00 q/ha compared to 117.50 q/ha in the check plots. The potential yield for this variety is 160.00 q/ha, leading to an extension gap of 18.50 q/ha and a technology gap of 24.00 q/ha, with a technology index of 15.00%.

The economic analysis (Table 3) presented the financial outcomes of the demonstrations. For instance, the GNLG-1 variety incurred a gross cost of 1,68,000 Rs. per hectare, resulting in a gross return of 2,92,600 Rs., a net return of 1,24,600 Rs., and a Benefit-Cost (BC) ratio of 1.74. In comparison, the check plots had a gross cost of 1,58,000 Rs., a gross return of 2,49,700 Rs., a net return of 91,700 Rs., and a BC ratio of 1.58, with a net return increase of 35.88%. Similarly, the GNPG-1 variety demonstrated a gross cost of 1,65,000Rs., a gross return of 3,40,000 Rs., leading to a net return of 1,75,000 Rs., and a BC ratio of 2.06. In contrast, the check plots had a gross cost of 1,60,000Rs., a gross return of 2,93,750 Rs., a net return of 1,33,750 Rs., and a BC ratio of 1.84. The demonstrations resulted in a net return increase of 30.84%.

Despite comparable expenses incurred for planting materials (20,000 Rs./ha) in both varieties, both GNLG-1 and GNPG-1 varieties demonstrated additional returns of 32,900 Rs. and 41,250 Rs., respectively. This underscores the economic benefits associated with the adoption of new varieties using systematic approaches.

Table 1 Total participant data and FLDs Detail of Little gourd and Pointed gourd varieties during the year 2022-23

Sr. No.	Crop and Variety name	Season	Area (ha)	Total Farmers
1	Little gourd (GNLG-1)	Summer	0.40	20
2	Pointed gourd (GNPG-1)	Summer	0.22	10

Table 2 Yield performances and calculations for FLDs of of Little gourd and Pointed gourd varieties during the year 2022-23

Sr. No.	Name of crop and variety demonstrated	Distance of planting in meter	Potential yield of the demo variety (q/ha)	Yield obtained (q/ha)		Extension gap (q/ha)	Technology gap (q/ha)	Yield increase (%)	Technology index (%)
				Demo Average (q/ha)	Check Average (q/ha)				
1	Little gourd (GNLG-1)	2*1	156.00	133.00	113.50	19.50	23.00	17.18	14.74
2	Pointed gourd (GNPG-1)	2*1	160.00	136.00	117.50	18.50	24.00	15.74	15.00

Table 3 Expenditure and Monetory Returns of FLDs on of Little gourd and Pointed gourd varieties during the year 2022-23

Sr. No.	Demonstration detail	Expenditure and Returns (Rs./ha)								Net Return increase percent	Additional	
		Demo				Check					Cost (Rs/ha)	Return (Rs/ha)
		Gross Cost (Rs/ha)	Gross Return (Rs/ha)	Net Return (Rs/ha)	B: C ratio	Gross Cost (Rs/ha)	Gross Return (Rs/ha)	Net Return (Rs/ha)	B: C ratio			
1	Little gourd (GNLG-1)	1,68,000	2,92,600	1,24,600	1.74	1,58,000	2,49,700	91,700	1.58	35.88	20,000	32,900
2	Pointed gourd (GNPG-1)	1,65,000	3,40,000	1,75,000	2.06	1,60,000	2,93,750	1,33,750	1.84	30.84	20,000	41,250

Conclusion

In conclusion, the demonstrations evidenced substantial improvements in both GNLG-1 and GNPG-1 varieties, resulting in enhanced yields and promising economic outcomes. These results emphasize the potential advantages of implementing scientific cultivation techniques, highlighting the value of adopting modern approaches to enhance agricultural productivity and profitability.

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