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Advances in Solanaceous Vegetables Research in Himachal Pradesh

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Solanaceae is a family with 96 genera and approximately 2,400 species distributed among all tropical and temperate regions of the world. Most of its species richness, however, is concentrated in the western hemisphere, particularly in South America, where the family is more diversified and has the largest number of endemic genera. Solanaceae stands out among flowering plants for its long history of human domestication and economic importance, comprising many crop species such as potato (*Solanum tuberosum* L.), tomato (*Solanum lycopersicum* L.), eggplant (*Solanum melongena* L.), chili peppers (*Capsicum* spp.) and tobacco (*Nicotiana tabacum* L.), as well as ornamental flowers like petunia (Petunia x hybrida (Hook.) Vilm.) and trumpet flower (*Brugmansia* spp.). Solanaceous vegetable crops play a significant role in human nutrition and to cope with malnutrition, especially as sources of vitamins like vitamin C, A, E, thiamine, niacin, pyridoxine, folacin, minerals and dietry fibre. They are termed as Protective Foods because these are rich source of minerals, vitamins and phytonutrients. Phytochemicals found in solanaceous vegetables like lycopene in tomato and peppers, nasunin in brinjal are strong antioxidants and are thought to reduce the risk of chronic disease by protecting against damage caused by free radicals, by modifying metabolic activation and detoxification of carcinogens. Tomato (*Lycopersicon esculentum*) is the 3rd most important vegetable crop next to potato and onion in India with respect to area and production. Tomato is highest source of lycopene (71.6%) among vegetable crops. India is considered as center of origin of brinjal. Phytochemicals contained in brinjal include phenolic compounds like caffeic and chlorogenic acid, and flavonoids, such as nasunin. India is major producer, consumer as well exporter of hot pepper in the world. Fresh peppers are considered excellent sources of vitamins C, K, carotenoids, and flavonoids. Several specific varieties of Solanaceous vegetables have been developed utilizing conventional breeding approaches in Himachal Pradesh by various research institutes and SAUs for various agroclimatic zones and climatic conditions. However, rapid progress is required to reduce the gap between potential yield and actual yield adverse environment. Thus, there is an urgent need of breeding climate for variety development which have great potential for meeting increased demand of solanaceous vegetables in Himachal Pradesh.

Keywords: Vegetable, Solanaceae, Himachal Pradesh, Crop Improvement, Hybrids.

Introduction

Solanaceae family consists of about 98 genera and approximately 2,715 species. It belongs to the order solanales in the Astrid group of dicotyledons. The Solanaceae family is known as "the night shade family" since it is descended from the genes solanum. It includes economically important crops such as potato, tomato, peppers, and brinjal. It is found both in temperate and tropical climates with largest concentration in Central and South America.

Leaves are alternating, spiral, and exstipulate. The flowers are bisexual, actinomorphic, and zygomorphic only infrequently.

Table 1. Solanaceous Vegetable crops

Sr. No.	Common Name	Botanical Name	Chromosome no.	Center of origin
1.	Tomato	*Solanum lycopersicum*	2n=24	Peru
2.	Brinjal	*Solanum melongena*	2n=24	India
3.	Chilli	*Capsicum annum* L.	2n=24	Mexico
4.	Bell pepper	*Capsicum annum* L.	2n=24	Mexico
5.	Potato	*Solanum tuberosum*	2n=4x=48	South America

Importance and Uses of Solanaceous Vegetables

Solanaceous vegetable crops play a significant role in human nutrition and to cope with malnutrition, especially as sources of vitamins like vitamin C, A, E, thiamine, niacin, pyridoxine, folacin, minerals and dietry fibre. They are termed as Protective Foods because these are rich source of minerals, vitamins and phytonutrients. Phytochemicals found in solanaceous vegetables like lycopene in tomato and peppers, nasunin in brinjal are strong antioxidants and are thought to reduce the risk of chronic disease by protecting against damage caused by free radicals, by modifying metabolic activation and detoxification of carcinogen.

1. Tomato

Tomato Research in HP

Recent released varieties in HP

A. Tomato Varieties/Hybrids Released by Dr. YSPUHF, Nauni, Solan

S.No	Variety/Hybrid	Type	Area Suitability	Avg. Fruit Wt. (g)	Yield (t/ha)	Special Features
1.	Solan Garima	F1 Hybrid	Low mid hills	80–85	66	Intermediate hybrid
2.	Solan Sindhur	F1 Hybrid	Mid hills	70–75	60	Intermediate hybrid
3.	Solan Red Round	Variety (Selection)	Intermediate zone	7–10	60–75	Cherry type, 70–75 days harvesting
4.	Solan Vajr	Variety (Selection)	Intermediate zone	70	42.5–47.5	Drought tolerant, early (70–75 days)
5.	Tomato UHF-13	F1 Hybrid	Intermediate zone	85–90	65–70	Early maturing hybrid
6.	Solan Gola	Variety (Selection)	Low & mid hills	80–90	50–55	Released variety
7.	Yashwant	Variety (Selection)	Mid hills	90–100	55–60	Released variety
8.	Solan Shagun (F1)	Hybrid	Mid hills	100–110	65–70	Released variety
9.	Solan Lalima	Variety (Selection)	Mid hills	80–85	50–55	Released variety
10	UHF-55	Variety (Selection)	Mid hills	75–85	55–60	Released variety

B. Tomato Varieties Released by CSKHPKV, Palampur

S.No	Variety	Type	Growth Habit	Fruit Color	Yield (q/ha)	Special Features
1	Him Palam Cherry Yellow	Variety	Determinate	Yellow	500–550	First yellow tomato, high β-carotene
2	Palam Pink	Variety	Determinate	Pink	200–250	Bacterial wilt resistant
3	Palam Pride	Variety	Indeterminate	Red	200–250	Bacterial wilt resistant
4	Palam Tomato Hybrid-1	Hybrid	Indeterminate	Red	650–700	Protected cultivation, high yielding

2.Brinjal
Brinjal Research in HP
Recent released varieties of Brinjal in HP
Brinjal Varieties Released by CSKHPKV, Palampur

S.No	Variety	Resistance	Fruit Description	Average Yield (q/ha)	Special Features
1	Arka Nidhi	Bacterial wilt	Attractive purplish red fruits	160–200	High resistance to bacterial wilt
2	Arka Keshav	Bacterial wilt	Purplish black fruits in clusters	300	Cluster bearing, high yielding

3.Chilli
Chilli Research in HP
Recent released varieties of Chilli in HP
Chilli Varieties Released by Dr. YSPUHF, Nauni and CSKHPKV, Palampur

S.No	Variety Name	Released By	Fruit Description	Fruit Habit	Harvesting Time	Yield (q/ha)	Special Features
1	DKC-8	Dr. YSPUHF, Nauni	Medium to large, green, straight, very pungent	Cluster (10–12)	110 days after transplanting	150–180	High pungency, cluster bearing
2	Him Palam Mirch-1 (DPCh-27)	CSKHPKV, Palampur	Medium long, slender, bright green, attractive, pungent	Cluster bearing	60 days (1st harvest)	100–125	Derived from Pusa Jwala × Surajmukhi
3	Him Palam Mirch-2 (DPCh-38)	CSKHPKV, Palampur	Long, broad, bright green, attractive, pungent	Single erect bearing	60 days (1st harvest)	100-150	

4.Capsicum

Recent released varieties of Bell pepper in HP

Capsicum Varieties Released in Himachal Pradesh

S.No	Variety Name	Released By	Fruit Description	Resistance/Tolerance	Avg. Yield (q/ha)	Special Features
1	Solan Bharpur	Dr. YSPUHF, Nauni	Deep green, 50–60 g average fruit weight	Tolerant to Phytophthora	300 (30 t/ha)	Disease tolerance, suitable for fresh market
2	Solan Yellow	Dr. YSPUHF, Nauni	4–5 cm long, turns red on ripening	Moderate virus tolerance*	75–100	Attractive fruit color development
3	Solan Hybrid-II	Dr. YSPUHF, Nauni	Tall plants, 3–4 lobed fruits, prolific bearer	Resistant to fruit rot and viruses	250–300*	High yield potential, hybrid vigor
4	Pusa Deepti (KT-1)	IARI, RRS Katrain (HP)	4–5 cm long, turns red on ripening	Moderate virus tolerance	75–100	Developed for mid hills, bright marketable fruits

5. Potato

Recent released varieties of Potato in HP

Potato Varieties Released by CPRI, Kufri (Shimla)

S.No	Variety Name	Year of Release	Yield (t/ha)	Adaptability	Purpose	Maturity	Special Traits
1	Kufri Chipsona-4	2019	30–35	Karnataka, West Bengal, MP, Gujarat	Processing	Medium	Suitable for chips
2	Kufri FryoM	2019	30–35	North-west & central plains	Processing	Medium	Resistant to late blight & PVY; suitable for French fries
3	Kufri Ganga	2018	35–40	North Indian plains	Table	Medium	Moderately resistant to late blight, tolerant to moderate drought
4	Kufri Karan	2019	22–25	Hills and plateau	Table	Medium	Highly resistant to late blight, 6 potato viruses & potato cyst nematodes

5	Kufri Lima	2018	30–35 (15–20 under heat stress)	North Indian plains	Table	Medium to late	Tolerant to early heat, hopper burn, mites; resistant to PVX & PVY; suitable for early/main season
6	Kufri Manik	2019	22–25	Eastern plains	Table	Medium	Resistant to late blight; rich in Fe, Zn, anthocyanin, carotenoids (biofortified)
7	Kufri Neelkanth	2018	35–40	North Indian plains	Table	Medium	Resistant to late blight; rich in antioxidants; excellent flavour; specialty potato
8	Kufri Thar-1	2019	30–35	East coast & middle Indo-Gangetic plains	Table	Medium	Drought tolerant (20% water saving); suitable for Odisha & UP

Conclusion

Solanaceous vegetables are a group of plants belonging to the Solanaceae family, which includes tomatoes, potatoes, peppers, and eggplants. Himachal Pradesh, with its diverse agro-climatic conditions, is known for the cultivation of these vegetables. Solanaceous vegetables are considered cash crops in many regions due to their commercial significance and high market demand. Solanaceous vegetables contribute essential nutrients, including vitamin C, dietary fiber and various antioxidants. Development of resistant varieties in solanaceous vegetables is critical not only for reducing the use of chemical inputs but also for ensuring food security and improving the livelihoods of farmers. Solanaceous vegetables promotes sustainable farming practices while increasing the availability and accessibility of these important crops. In Himachal Pradesh, solanaceous vegetables plays a crucial role in addressing agricultural challenges, enhancing food security, and contributing to the economic and nutritional well-being of communities.