

Unravelling the taxonomic identity of Kashmiri shallot 'Pran': A probable co-existence of multiple species

Geetika Malik

`geetika.pf1@gmail.com`

ICAR-Central Institute of Temperate Horticulture, Srinagar

Sheikh M. Sultan

ICAR-NBPGR Regional Station, Srinagar

Jiffinvir Singh Khosa

Punjab Agricultural University, Ludhiana

Ashwini Benke

ICAR-Directorate of Onion and Garlic Research, Pune

Short Report

Keywords: Pran, shallot, *Allium x cornutum*, *Allium proliferum*, *Allium cepa* L. var. *aggregatum*, triploid shallot, ploidy, cytotype, taxonomy, descriptors

Posted Date: July 23rd, 2025

DOI: <https://doi.org/10.21203/rs.3.rs-7185607/v1>

License:   This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Additional Declarations: The authors declare no competing interests.

Unravelling the taxonomic identity of Kashmiri shallot '*Pran*': A probable co-existence of multiple species

Geetika Malik^{1*}, Sheikh M. Sultan², Jiffinvir Singh Khosa³, Ashwini Benke⁴

¹ICAR-Central Institute of Temperate Horticulture, Srinagar, Jammu & Kashmir, India

²ICAR-NBPGR-Research Station, Srinagar, Jammu & Kashmir, India

³Punjab Agricultural University, Ludhiana, Punjab, India

⁴ICAR-DOGR, Rajgurunagar, Maharashtra, India

Abstract

Kashmiri *Pran* is a well-known shallot of North Indian territory of Jammu & Kashmir. A traditional and underutilized crop, it is gaining popularity due to its volatile biochemical composition and international demand. Gearing up for improved trait breeding and export, *Pran* needs to be systematically classified first. Also, its conservation is necessary to avoid species extinction in the region, as growers are exceedingly disinterested in growing it commercially against onion and other mainstream crops. *Pran* is popularly known as a triploid viviparous shallot and most recently being named *Allium x cornutum* Clementi ex Visiani. However, this naming is by virtue of more or less indirect studies or on the basis of fewer accessions not covering all of the diversity of *Pran* that exists, which critically necessitates a directed approach to solving the problem of *Pran*'s systematics. The reported work is a more comprehensive and inclusive study aimed directly at ascertaining species identity of *Pran*. Tools like morphological/ botanical descriptors, cytometry and molecular approaches were employed for the detailed study. Many important observations point to the existence of more than one species under the umbrella of *Pran*, specifically *Allium x cornutum* Clementi ex Visiani, *Allium proliferum* and *Allium cepa* L. var. *aggregatum*.

Keywords: *Pran*, shallot, *Allium x cornutum*, *Allium proliferum*, *Allium cepa* L. var. *aggregatum*, triploid shallot, ploidy, cytotype, taxonomy, descriptors

* Corresponding author

Introduction

In general terms, shallots mean bunched up small onions originating vegetatively from a single bulb, irrespective of other botanical differences. In many parts of the world, 'shallots' are traditional niche crops and locals call them by different names like *Ljutika* in Croatia, *Griselle* in France, *Bewang Merah* in Indonesia, *Rakkyo* and *Wakegi* in Japan, *Sambar Eerulli* or *Chikk-Eerulli* in South Indian state of Karnataka and *Pran* in Kashmir region of North India. Till 2010, shallots were identified as a distinct species *Allium ascalonicum*. However, later the differences from onion (*Allium cepa* L.) were realized to be too small to assign a different species to shallot. They were then designated as cultivar group of onion and named *Allium cepa* Aggregatum group (Fritsch and Friesen, 2002). However, some of the shallots are actually distinct species known to have different ploidies. Where Egyptian walking onion (*Allium proliferum*) and potato onions (*Allium cepa* var. *aggregatum*) are established diploids ($2n=2x=16$) (Puizina 2013), *Ljutika* (*Allium* x *cornutum* Clementi ex Visiani) is a triploid ($2n=3x=24$) (Fredotovic et al 2014). Nevertheless, shallots are called shallots only for their morphological features, for example, Egyptian walking onion or *Wakegi* is *Allium proliferum* and *Ljutika* is *Allium x cornutum*. South Indian shallots have been recognized as potato onions and scientifically called *Allium cepa* var. *aggregatum*. With respect to *Pran*, the traditional niche shallot of Kashmir, India, however, the present understanding of its taxonomy remains confounding with several workers reporting different botanical names. For a very long time, *Pran* has been called by different specific names starting from *Allium cepa* var. *viviparum* (Koul and Gohil 1971) to *Allium x proliferum* Syn. *Allium proliferum* (Pandey et al 2020) and *Allium x cornutum* (Zeljana et al 2014). Some studies like those of Koul and Gohil (1971), Puizina and Papes (1997) and Fredotovic et al (2014) have used *Pran* for cytogenetic investigations and referred to it as triploid shallot. It is worth mentioning here that they used only one or few of the samples, which obviously cannot cover all *Pran* diversity that exists in Kashmir. Therefore, probability remains that there may be more shallot species contributing collectively to the existing *Pran* in Kashmir.

Correctly identifying *Pran* is critical to leveraging the potential of this underutilized crop of Kashmir. *Pran* is the mainstay of thousands of peasant families of Kashmir, as it is a high premium vegetable during slack period. Its unique volatile biochemistry and increasing demand from abroad further presses the need for its systemic identification to enable breeders for its genetic improvement. Furthermore, in the present times when need for safeguarding the ecology is being felt very strongly, conservation of as many species as possible is crucial. Potential traits like drought tolerance and health promoting factors in this crop can be utilized

effectively. Moreover, the present studies on *Allium* systematics will be empowered by correct identification of all species encompassing this crop. Keeping these facts in view, this report underpins the future comprehensive studies on Kashmiri shallot '*Pran*' to determine the correct specie(s) involved.

Realizing this need, ICAR-Central Institute of Temperate Horticulture, Srinagar has systematically characterized 20 *Pran* accessions to ascertain the species they might individually belong to. This work has been initiated at all possible levels, i.e., botany, ploidy determination by chromosome counting and flowcytometry, cytotype identification and molecular characterization. This first report on *Pran*'s characterization with respect to taxonomic studies carries some of the revelations obtained till date regarding morphological, reproductive and some molecular aspects. Work on the aspects not yet reported here is underway for more comprehensive determinations.

Material and methods

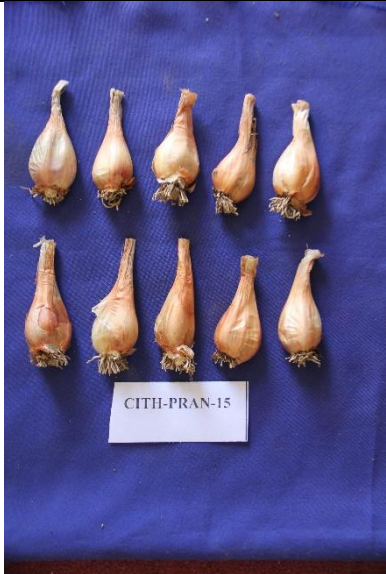
The study was done at experimental farm of ICAR-Central Institute of Temperate Horticulture, Srinagar where well-recognized field gene bank of 20 *Pran* accession collected across Kashmir valley is being maintained for the last 17 to 1 year. The field gene bank comprises accessions collected from 2008 to 2024. The details of the accessions are presented in the Table 1 and plate 1(contrasting traits).

Table 1: Details of *Pran* collections at ICAR-CITH, Srinagar

Nomenclature	National identity	Source	Year of collection
CITH-Pran-1	IC-594211	Parimpora, Srinagar	2008
CITH-Pran-2	IC-594212	Parimpora, Srinagar	2008
CITH-Pran-3	IC-594213	Parimpora, Srinagar	2008
CITH-Pran-4	IC-594214	Parimpora, Srinagar	2008
CITH-Pran-5	IC-594215	Parimpora, Srinagar	2008
CITH-Pran-6	IC-594216	Parimpora, Srinagar	2008
CITH-Pran-7	IC-0598214	Parimpora, Srinagar	2009
CITH-Pran-8	IC-0598215	Parimpora, Srinagar	2009
CITH-Pran-9	IC-0598216	Parimpora, Srinagar	2009
CITH-Pran-10	IC-0598217	Parimpora, Srinagar	2009
CITH-Pran-11	Applied for	Parimpora, Srinagar	2010
CITH-Pran-12	Applied for	Parimpora, Srinagar	2010
CITH-Pran-13	Applied for	Parimpora, Srinagar	2010
CITH-Pran-14	Applied for	Parimpora, Srinagar	2010
CITH-Pran-15	Applied for	Bijbehara, Anantnag	2015
CITH-Pran-16	Applied for	Buthoo, Bandipora	2016
CITH-Pran-17	Applied for	Srinagar	2018
NBPGR-4	-	NBPGR-RS, Srinagar	2024

NBPGR-5	-	NBPGR-RS, Srinagar	2024
NBPGR-9	-	NBPGR-RS, Srinagar	2024

	
CITH-Pran-16	CITH-Pran-7
Spathe	
	
CITH-Pran-16	CITH-Pran-7
Opened inflorescence	

 CITH-Pran-3 (elliptic)	 CITH-Pran-15 (medium ovate)
Bulblet shape	
 CITH-Pran-16 (violet-cream)	 CITH-Pran-3 (cream)
Color of bulblet epidermis	

Observed traits

More than 40 morpho-agronomic characteristics were observed from 2021 to 2025 in twenty accessions along with SSR genotyping, pollen viability assessment and cytotype identification of seventeen of these accessions. Some critically differentiating traits have been mentioned in table 2 followed by their method of observation.

Table 2: Crucial traits studied for species determination in 20 accessions of Kashmiri *Pran*

S. no.	Stage	Trait
1	Vegetative	Bulblet height (cm)
2		Bulblet diameter (cm)
3		Number of bulblets/ cluster
4		Average bulblet weight (g)
5		Degree of bulblet splitting
6	Reproductive	Number of flowers per umbel
7		Number of bulbils per umbel
8		Bulbil height (cm)
9		Bulbil diameter (cm)
10		Pollen viability (%)
11	Post harvest	Bulblet total soluble solids (° Brix)
12		Bulblet dry matter (%)
13	CytoplasmicDNA polymorphism	accD marker based cytotype polymorphism
14	Nuclear DNA polymorphism	SSR polymorphism

Methodology used for the observations

1. Number of flowers per umbel

The flowers and buds in each of the 10 umbels were counted when more than 50 percent flowers opened in the umbel.

2. Number of bulbils per umbel

The bulbils in each of the 10 umbels were counted well after 100 percent flowers had opened in the umbel.

3. Bulbil height (cm)

The bulbil height was measured with Vernier calliper from its base till the point where constriction into the neck starts. The measurement was done on 10 bulbils.

4. Bulbil diameter (cm)

The bulbil diameter was measured with Vernier calliper between the widest points. The measurement was done on 10 bulbils.

5. Bulblet total soluble solids (° Brix)

The total soluble solids were estimated with the help of manual refractometer. The readings were taken from 10 bulblets after curing of the bulbs.

6. Bulblet dry matter (%)

The dry matter of bulblets was determined by drying 100 g of cured and peeled bulblets at 60 °C until weight of the samples became constant. This weight was then estimated on digital weighing machine.

7. Bulblet height (cm)

The bulblet height was measured with Vernier calliper from its base till the point where neck starts. The measurement was done on 10 bulblets.

8. Bulblet diameter (cm)

The bulblet diameter was measured between the widest points with Vernier calliper. The measurement was done on 10 bulblets.

9. Number of bulblets per cluster

The bulblet cluster was kept intact at harvesting till the time their number was counted after curing. It was done on 10 representative clusters.

10. Average bulblet weight (g)

Ten individual bulblets were weighed on digital weighing balance to work out the average.

11. Degree of bulblet splitting

This trait was observed visually on individual bulblets to observe further splitting of bulblet within the same tunic.

12. Pollen viability

The viability of pollens of each accession was ascertained with acetocarmine staining observed at 10 X and 40 X magnification under stereomicroscope.

13. accD marker based cytoplasmic polymorphism

The cytoplasm of the accessions was scored for sterility with accD markers developed by Von Kohn et al (2013) by amplifying the chloroplast DNA using PCR. The checks used were male fertile and male sterile cytoplasms of onion isolated from maintainer and male sterile lines, respectively.

14. SSR based DNA polymorphism

SSR markers developed from *Allium* species available in public domain were used to divulge polymorphism for microsatellite DNA in *Pran* using PCR amplification.

Results and discussion

In up to 20 well established accessions studied from time to time for various traits adding up to more than 40 traits and general observations on their growth and development, the results obtained are discussed below.

1. Number of flowers per umbel

The germplasm showed varied flowering behaviour during the study period. During 2023 and 2024 seasons, seventeen of these accessions produced no (absent flowering) to an average of 236 flowers per umbel. While CITH-Pran-16 always grew a scape terminating into a spathe, other accessions from CITH-Pran-1 to CITH-Pran-15 and CITH-Pran-17 did not routinely produce a scape. The spathe of CITH-Pran-16 always opened to reveal bulbils with no for very few flowers, a typical sexual feature of *Allium proliferum*. The spathe in all other accessions always bore flowers on opening and developed into proper umbel bearing numerous normal looking flowers. The bulbils appeared much later into development of the umbel. This kind of flowering behaviour is seen in *Allium x cornutum*. In *Allium cepa* var. *aggregatum*, the flowering is similar however bulbils are not formed (Major *et al* 2018) and true seeds are set.

2. Number of bulbils per umbel

Number of bulbils varied across accessions with CITH-Pran-16, NBPGR-4, NBPGR-5 and NBPGR-9 having more bulbils than flowers. In all other accessions, the bulbils appeared much later and were fewer than the number of flowers. Across the 17 accessions, bulbil number ranged from none to 12.33 during 2024 season. Although flowering has not been a regular feature of any of these accessions, except for CITH-Pran-16, which has always produced scape that harbours bulbils in the inflorescence along with no or very few flowers. In two years (2024 and 2025) of observations on NBPGR-4, 5, 9 at experimental farms of CITH and NBPGR-RS, Srinagar similar flowering behaviour has been observed. This feature is typical of *Allium proliferum*, which is known to produce bulbils regularly irrespective of environmental factors and they also appear before or in conjunction with few flowers or no flowers at all (Major *et al* 2018). While *Allium x cornutum* also produces bulbils, their number is fewer and they appear much later after flowering.

3. Bulbil height (cm)

The average bulbil height of the accessions that flowered ranged from 0.81 cm to 1.08 cm across 2023 and 2024 seasons. The tallest bulbils were observed in CITH-Pran-16. CITH-Pran-9 didn't flower in any of these seasons while CITH-Pran-17 flowered only in 2024. *Allium proliferum* generally has larger bulbils compared to *Allium x cornutum*. This observation again points to the possibility of CITH-Pran-16 being *Allium proliferum*.

4. Bulbil diameter (cm)

The average bulbil diameter of these accessions across the two seasons ranged from 0.79 to 1.22 cm with CITH-Pran-16 having the widest bulbils. The sizes in all other accessions were comparable with each other but smaller than CITH-Pran-16. However, dimensions of bulbils in CITH-Pran-17 were available only in one season. The bulbils of *A proliferum* are specifically bigger than those of *Allium x cornutum* as studied by other workers also (Major et al 2018). Similar observation here suggests the possible presence of both *Allium x cornutum* and *Allium proliferum* in this germplasm.

5. Bulblet total soluble solids (°Brix)

The average total soluble solids in the bulbils of the germplasm during 2023, 2024 and 2025 ranged from 16.34 to 24.61 °Brix. The highest TSS was observed in CITH-Pran-17 (24.61) and CITH-Pran-16 (22.79). The expected *Allium proliferum* accession CITH-Pran-16 was among the highest TSS accessions. As previously studied, the total soluble solids in *Allium x cornutum* and *Allium proliferum* are comparable, whereas those of *Allium cepa* var. *aggregatum* are higher in amount (Major et al 2018). Hence, this germplasm might have only *Allium x cornutum* and *Allium proliferum* but may this not hold true for all *Pran* landraces of Kashmir due to the possibility of some of them being *Allium cepa* var. *aggregatum*.

6. Bulblet dry matter (%)

The dry matter content of bulbils varied significantly across 17 accessions. *Allium proliferum* and *Allium x cornutum* studied in Croatian shallot germplasm had greater dry matter content (around 25 %) in their bulbs compared to onion (*Allium cepa* L. and *Allium cepa* L. var. *aggregatum*) (Major et al 2022). This shallot germplasm indeed expressed significantly higher dry matter than onion ranging from 23.07 to 40.82 per cent. There were significant differences for dry matter among accessions also with CITH-Pran-2 and CITH-Pran-10 having the highest dry matter in the bulblets. CITH-Pran-16 expressed lower dry matter of 23.07 %. Since, *Allium cepa* L. var. *aggregatum* is expected to have lower dry matter compared to the detected values, it points to the possibility of this germplasm being devoid of this species.

7. Bulblet height (cm)

The bulblet height of germplasm ranged from 3.47 cm to 4.59 cm. This parameter was comparable in all accessions with no significant differences. Nevertheless, CITH-Pran-16 was among the accessions with the tallest bulblets.

8. Bulblet diameter (cm)

The bulblet diameter of the germplasm, one of the most distinguishing features among shallot species, varied significantly among *Pran* accessions under study. The average of diameters in

2023 and 2024 ranged from 2.26 cm to 3.70 cm. The widest bulbs were found in CITH-Pran-16, which was significantly larger than the bulblets of all other accessions. In a study by Major et al (2018), bulb diameter in *A. proliferum* and *A. cepa* var. *aggregatum* was found to be generally higher than in *Allium x cornutum*.

9. Number of bulblets per cluster

This characteristic varied significantly in the germplasm with a wide range of 4.50 to 24.25 bulblets per cluster as the average of two seasons (2023 and 2024). The lowest number (4.50) was found in CITH-Pran-16 which was significantly lower than all other accessions although there were significant differences among those accessions also (14.50 – 24.25 bulblets/ cluster). In 2025, CITH-Pran-16, NBPGR-4, NBPGR-5 and NBPGR-9 also yielded lowest bulblet numbers of 10.70, 9.50, 8.40 and 4.66, respectively, per cluster relative to rest of the 16 accessions. A study by Perkovic et al (2020) on three different species of shallot found in Croatia found that number of bulblets per cluster were considerably lower in *Allium proliferum* (1-3) compared to both *Allium x cornutum* (4-25) and *Allium cepa* L. *aggregatum* (3-25). Similar observations were made by Major et al 2018 who found that *Allium proliferum* produced around 7-9 bulblets per cluster compared to much larger numbers of 10 to 54 by *Allium x cornutum* and 10 – 22 by *Allium cepa* L. var. *aggregatum*. The same trend encountered in this study points to the possibility of at least one *Allium proliferum* accession in the germplasm. This can be extrapolated to presence of *Allium proliferum* in whole of Kashmir.

10. Average bulblet weight (g)

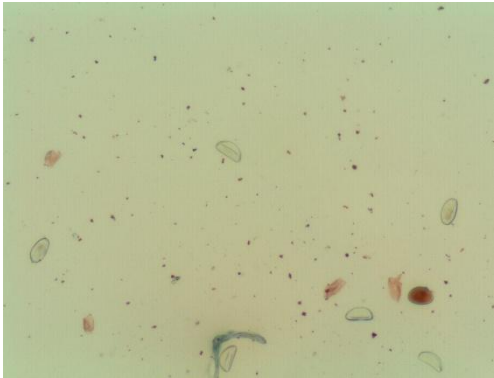
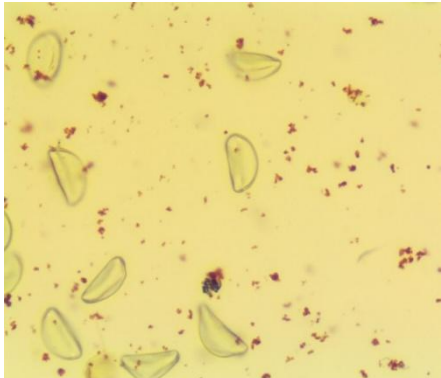
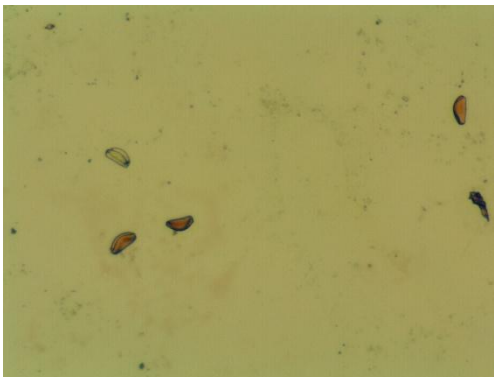
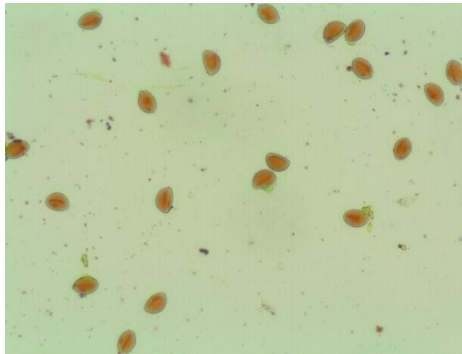
The average weight of bulblets is an important trait involved in species differentiation. Generally, bulblets of *Allium proliferum* are heavier than *Allium x cornutum* and *Allium cepa* var. *aggregatum*. Similar situation was observed in this study wherein significant differences in bulblet weight were observed with CITH-Pran-16 being the heaviest at 37.48 g as average bulblet weight across 2023 and 2024 seasons. Bulblets of all other accessions were significantly lighter than those of CITH-Pran-16. However, there were significant differences among these accessions also.

11. Degree of bulblet splitting

This trait was visually observed on harvested bulblets. CITH-Pran-1, NBPGR-4, NBPGR-5 and NBPGR-9 had considerably lower degree of bulblet splitting compared to all other accessions. All these accessions exhibit similar vegetative and floral characteristics among themselves suggesting they all may be *Allium proliferum*.

12. Pollen viability

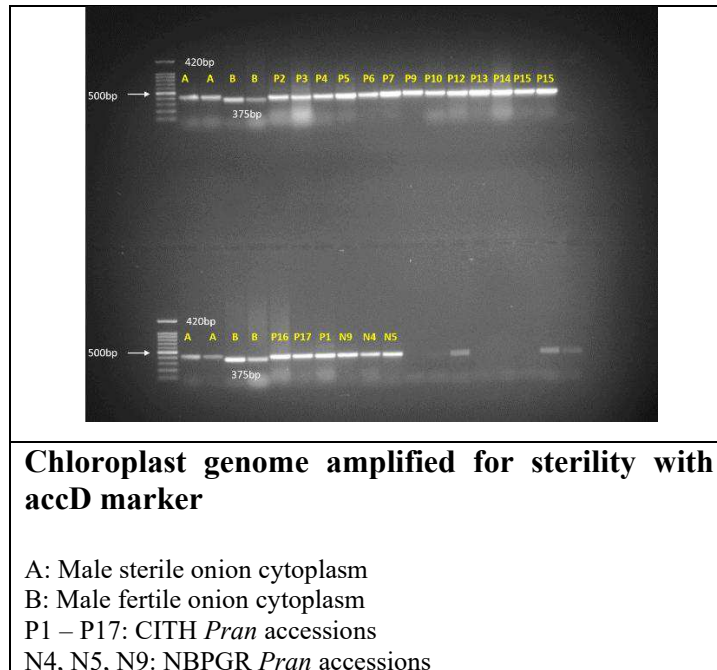
Allium proliferum and *Allium x cornutum* are known to be sexually sterile while *Allium cepa* var. *aggregatum* can reproduce sexually as well as propagate vegetatively via bulblets. *Allium x cornutum* is widely identified as sterile due to its triploid genome, whereas, *A proliferum* despite being diploid is observed to show sexual sterility and serves as striking example of obligatory asexually reproducing species. In acetocarmine testing of pollens obtained from flowers of the 14 accessions that flowered in 2025, CITH-Pran-14 and CITH-Pran-15 have shown at least partial pollen viability, as several of the pollens stained with acetocarmine compared to absolutely no straining in any of the remaining 12 accessions. The author has also observed CITH-Pran-15 to flower more regularly and heavily compared to other accessions. It can probably be assigned *Allium cepa* var. *aggregatum* species if other morphological, cytometric and molecular observations validate the same.

	
CITH-Pran-14 (Partially stained pollens)	CITH-Pran-2 (all pollens unstained)
	
CITH-Pran-15 (Partially stained pollens)	Onion var. Brown Spanish (mostly stained pollens)

13. accD marker based cytoplasmic DNA polymorphism

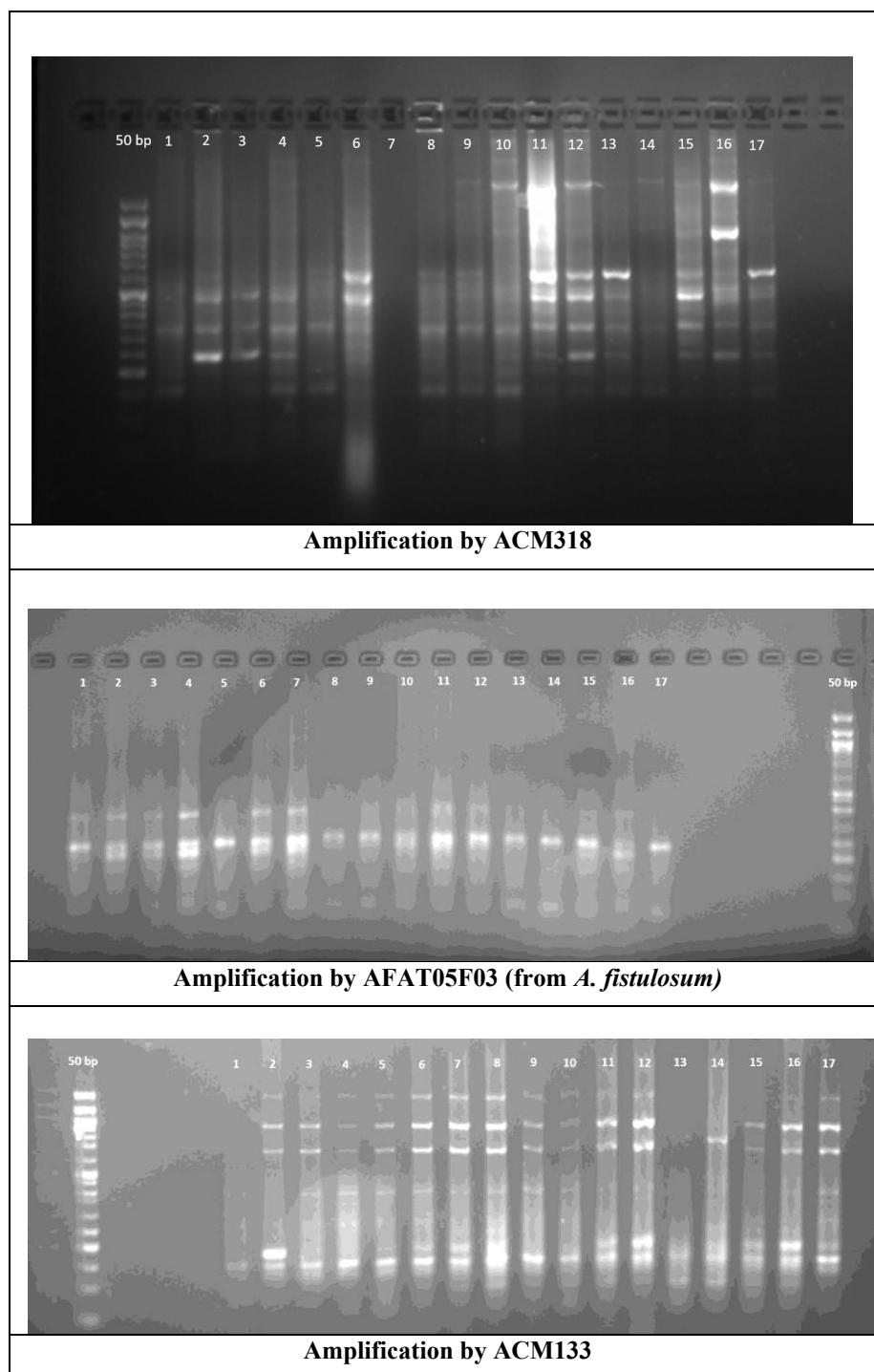
The accD marker (Von Kohn et al 2013) designed to distinguish between S and N type of cytoplasm in *Allium* species amplified only cytoplasmic sterility specific allele (420 bp) in all

the accessions except CITH-Pran-8 and CITH-Pran-11, which could not be amplified for external reasons. The cytoplasm of onion (*Allium cepa* L.) male sterile lines (A) and maintainer lines (B) were used as checks for sterility (420 bp) and fertility (375 bp) specific alleles, respectively.



14. SSR based DNA polymorphism

Although SSR polymorphism does not necessarily reveal species differences, nevertheless some preliminary work on SSR genotyping in *Pran* germplasm at the institute for other purpose has revealed polymorphism among accessions with respect to some of the *Allium* SSRs available in public domain. Three of these markers have revealed allelic polymorphism among 17 accessions (CTH-Pran-1 to CITH-Pran-17) pointing to differences in microsatellites regions of the genomes.



Conclusion

In India, a new inclination towards assigning specific name *Allium x cornutum* Clementi ex Visiani to Kashmiri *Pran* has been observed in recent times probably due to the most recent nomenclature of all triploid shallots as *Allium x cornutum* Clementi ex Visiani. *Pran* has been known by different specific names since the inception of endeavours that used it primarily for phylogenetic studies of other alliums. Described as a triploid and named *Allium cepa* var. *viviparum* by Singh et al (1971), Kashmiri *Pran* automatically came to be recognized

as a triploid shallot without considering the possibility of occurrence of other shallot species also. With updates in taxonomic circles, *Allium cepa* var. *viviparum* became less popular and instead names like *Allium proliferum* and *Allium cepa* var. *aggregatum* became prevalent. Simultaneously, workers in Kashmir and elsewhere, mostly within India, started referring to *Pran* as *Allium proliferum* or *A cepa* var. *aggregatum*. Whatever, the name used, the ploidy of *Pran* was accepted to be triploid by the most. This created a confusion because specific name *proliferum* can only be used for diploid shallot, i.e., Egyptian walking onion. To add to the contradiction, more recent authors (Ahsan et al 2025; Saleem et al 2023) started citing the name *Allium x cornutum* without considering that many of farmer varieties/ landraces/ accessions, especially from Bandipora district share morphological traits with *Allium proliferum* and some with *Allium cepa* var. *aggregatum* (multiplier onion/ potato onion).

To address this confusion, multifaceted study on 17 well-established accessions at ICAR-Central Institute of Temperate Horticulture, Srinagar were initiated in 2021 involving comprehensive agro-morphological and molecular assessments. Study was further extended to chromosomal counting, flowcytometry and cytotype specific molecular studies in the following years. Three more accessions were included in this study with contribution from ICAR-NBPGR-RS, Srinagar in 2024 to widen the germplasm for all-encompassing conclusions.

Crucial characteristics determinative of species differences have been discussed in this report to update knowledge on *Pran* systematics. The observation on these traits suggests the possibility of multiple species being collectively called *Pran* and not just single species, i.e., *Allium x cornutum*. However, more advanced and validity investigations are underway to ascertain these differences and validate the results.

References

1. Ahsan S, Nazir G, Lone A H, Tabasum S, Nazir N, Ahmad I, Hussain K, Masoodi U H and Berjes S (2025) Correlation coefficient and path analysis studies in native collections of Kashmiri *pran* (*Allium X Cornutum* Clem. ex Vis). *Plant Archives* 25 (1): 2282-2286
2. Fritsch R M and Friesen N (2002) Evolution, domestication and taxonomy. In *Allium* crop science: recent advances, Rabinowitch H. D., Currah L. (ed.), 5–30. Wallingford, United Kingdom: CABI.

3. Koul A K and Gohil R N (1971) Further studies on natural triploidy in viviparous onion. *Cytologia* 36: 253-271

4. Major N, Goreta Ban S, Urli B, Ban D, Dumi G and Perković J (2018) Morphological and biochemical diversity of shallot landraces preserved along the Croatian coast. *Frontiers in Plant Science* 9:1749

5. Major N, Perković J, Palčić I, Bažon I, Horvat I, Ban D, Goreta Ban S (2022) The phytochemical and nutritional composition of Shallot species (*Allium* × *cornutum*, *Allium* × *proliferum* and *A. cepa* Aggregatum) is genetically and environmentally dependent. *Antioxidants* (Basel) 11(8):1547. doi: 10.3390/antiox11081547

6. Perković J, Major N, Ban D, Cvitan D, Ban S G (2021) Shallot species and subtypes discrimination based on morphology descriptors. *Plants* 10: 60. <https://doi.org/10.3390/plants10010060>

7. Puizina J (2013) Shallots in Croatia – genetics, morphology and nomenclature. *Acta Botanica Croatica* 72 (2): 387–398

8. Saleem T, Khan S H, Jabeen N and Sultan T (2023) *Pran*: Endemic edible Allium of Kashmir. *Agri Articles* 3 (1): JAN-FEB, 2023

9. Von Kohn C., Kielkowska A and Havey M J (2013) Sequencing and annotation of the chloroplast DNAs and identification of polymorphisms distinguishing normal male-fertile and male-sterile cytoplasms of onion. *Genome* 56: 737-42