

Diversity and Medicinal Uses of Allium sp. found in India

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Abstract

•The genus Allium comprises almost 950 species. •Onion, Garlic, Chives and Leeks are the oldest domesticated Allium as a food worldwide.

Central Asia is known to be primary centre of origin of Allium sp.

•Western India and North East part of India is having rich diversity of underutilized Allium species viz. A. schoenoprasum, A. hookeri, A. fragrance, A.macaranthum, A.roylei are found in India.

• The various Allium species are known spices, vegetables and medicinal value and used since ancient time for their therapeutic properties.

•Allium species are rich source of secondary metabolites and phytochemicals viz. flavonoids, alkaloids, sulphides, saponins, polysaccharides, polyphenols and several sulfur containing amino acids cysteine compunds.

• Allium sp. are used for the treatment of cancer, cardiovascular diseases, diabetes, various allergies, arthritis and enhancing immune system.

•The present review provides a significance about diversity and medicinal uses of Allium sp. present in India

Introduction

•Wild Allium species are an important reservoir of useful genes for imparting resistance to biotic, abiotic stresses and enhancing nutritional value. •Indians are using wild Allium species as vegetables, condiments, and for its medicinal and

ornamental value in the Indian Himalayan region. as semi-domesticated types or wild economic species (Pandey et al., 2008) and some species occur in temperate and alpine regions of Himalaya (Polunin and Stainton 1984; Karthikeyan et al., 1989).

•Due to the sporadic natural distribution of Allium sp., its genetic diversity has been recently studied by Jaiswal et al., 2022 and Khade et al., 2022 using ILP markers.

•The SRAP is a polymerase chain reaction (PCR) based and efficient molecular marker technique with reasonable throughput rate, ability to disclose numerous co-dominant markers, more reproducible than RAPDs and are easier to assay than AFLPs and, most importantly, targeting of open reading frames (ORFs) (Li and Quiros, 2001). •In present study we have used SRAP markers. •Medicinal value of various Allium species has been reported previously by various scientists. •Alliums are rich source of metabolites and phytochemicals. •Presence of various bioactive compounds plays key role in adding medicinal benefits to Allium species. •Recently various studies has been carried out on role of Allium extracts on curing cardiovascular diseases, carcinogenic tumors, cough, allergies •Thus biochemical diversity of India wild Alliums is prerequisite for studying their medicinal value.

Results

A ampeloprasumL. All-697

fistulosum All-750

l ascaloniaenPran-1

LascaloniaenPren-2

moschatun MMK-136

A oreoprasumMMK-134

A cythoporumMMK-130

anthunNMK-3229 anthunNMK-3237 riffithianmIC-255676

prezwalskianum MMK-128 lliums spp. MMK-131

1 schoenoprasumNGB-996 A tuberosum NMK-3214

A tuberosum XMK-3215 A satimon (Dhima Purple)

A satirum (Bhima Om kar) safinanNMK 3210

fragransIC-383446 asciculatunNMK-323 oschaninii EC-328495

hookeniiNMK-3235 4 fasciculatunNMK-3234

A angulosumEC-328486

oschaninii EC-328494 senescenceEC-328503

fistulosumL.China All-646

edebourizzanEC-328491 A cova(BhimaShubha l cepa(BhimaSuper)

Materials and methods

Material : Allium cepa L., A. sativum L., A. fistulosum L. A.ampleloprasum, A,alticum L., A. tuberosum L., A. fragrance L., A.fasiculatum L., A.hookeri L., A.angulosum L., A.corolinianum L. A.senesence, A.griffithanum, A.macaranthum , A.ledeborianum, A.ascolinicum, A.ochianinii , A. moschatum , A. oreoprasum , A. prezwalskianum and A. cythoporum

Method: DNA extraction was done by CTAB method with some modifications. PCR amplification was carried out in total volume of 25 μL.

List of primers used:

Primers	Sequence (5'-3')	
combination	Forward	Reverse
ME1-EM1	TGAGTCCAAACCGGATA	GACTGCGTACGAATTAAT
ME1-EM2	TGAGTCCAAACCGGATA	GACTGCGTACGAATTTGC
ME1-EM3	TGAGTCCAAACCGGATA	GACTGCGTACGAATTGAC
ME1-EM4	TGAGTCCAAACCGGATA	GACTGCGTACGAATTACG
ME1-EM5	TGAGTCCAAACCGGATA	GACTGCGTACGAATTACT
ME1-EM6	TGAGTCCAAACCGGATA	GACTGCGTACGAATTAGC
ME2-EM1	TGAGTCCAAACCGGAGC	GACTGCGTACGAATTAAT
ME2-EM2	TGAGTCCAAACCGGAGC	GACTGCGTACGAATTTGC
ME2-EM3	TGAGTCCAAACCGGAGC	GACTGCGTACGAATTGAC
ME2-EM4	TGAGTCCAAACCGGAGC	GACTGCGTACGAATTACG
ME2-EM5	TGAGTCCAAACCGGAGC	GACTGCGTACGAATTACT
ME2-EM6	TGAGTCCAAACCGGAGC	GACTGCGTACGAATTAGC
ME3-EM1	TGAGTCCAAACCGGAAT	GACTGCGTACGAATTAAT
ME3-EM2	TGAGTCCAAACCGGAAT	GACTGCGTACGAATTTGC
ME3-EM3	TGAGTCCAAACCGGAAT	GACTGCGTACGAATTGAC
ME3-EM4	TGAGTCCAAACCGGAAT	GACTGCGTACGAATTACG

Discussion

•Allium genus consists of 950 species , among which onion, garlic and chives used as a food in form of vegetable, spices and medicinal purpose. •Functional components found in Allium accelerate its use in nutraceutical, pharmaceutical industries.

•Molecular and morphological diversity of Alliums between species and among species has been studies by many researcher based on geography, morphology and biochemcial traits.

•Allium sp are rich in Nonstarchy carbohydrates (dietary fibres, resistant starch, and fucoidan)

 Antioxidants (organosulfur compounds, polyphenols, carotenoids, tocopherols, tocotrienols, phytosterols, and isoflavones) •They are good source of unsaturated fatty acids, bioactive peptides, sterols, and phytoestrogens. •Sulfur containing compounds such as diallyl

thiosulfinate (allicin), diallyl trisulfide, allyl methyl trisulfide, diallyl disulphide, ajoene, and others are effective against anticancer, antioxidation, antiinflammation, immunomodulatory, antimicrobial, hypoglycemic, and cardiovascular protections.

•The S-ethyl cysteine or S-methyl cysteine can protect bronchial cells and respiratory epithelia.

•The major components of onion were quercetin, quercetin glucosides, isorhamnetin glucosides, and kaempferol glucoside can decrease the levels of blood glucose, serum lipids, oxidative stress, and lipid peroxidation, meanwhile increasing insulin secretion and antioxidant enzyme activity. •Saponine compounds found in Allium used as a effective fungicide.





A.sativum

A.cepa







A.chinense





A. ampeloprasum

A.tuberosum



•Thus, the Allium is boon for human health.

Fig. 1 Dendrogram of 32 Allium species revealed by UPGMA cluster analysis based on Jaccard's genetic dissimilarity index estimates derived from SRAP fingerprints

Fig: 2 Principal component analysis (PCA) and dendrogram clustering of the normalized metabolite intensities: (A) PCA loading and score plots of PC1 and PC2, (B) top metabolite contribution percentages to PC1 and PC2, and (C) the dendrogram cluster <u>Abdelrahman</u> et al.2021

Conclusion

•Molecular markers were able to distinguish the different Allium species and needful to establish their genetic relationship. The results also support information that use of SRAP markers should be viewed analogous to morphological character states.

•The genus Allium especially onion, garlic and chives has high value as a functional food due to presence of bioactive compounds used for preventing chronic disease in human being.



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