

Species Datasheet

Datasheet No. A-073.002.009
(family.genus.species)

DBT- Network Programme

1. Taxon:

Species *Allium cepa* L.
Subspecies
Variety
Cultivar
Hybrid

Image file

2. Synonyms: *Allium cepa* var. *aggregatum* G.Don, *A. cepa* var. *anglicum* Alef., *A. cepa* var. *argenteum* Alef., *A. cepa* var. *bifolium* Alef., *A. cepa* var. *cepa*, *A. cepa* var. *crinides* Alef., *A. cepa* var. *flandricum* Alef., *A. cepa* var. *globosum* Alef., *A. cepa* var. *hispanicum* Alef., *A. cepa* var. *jamesii* Alef., *A. cepa* var. *lisboanum* Alef., *A. cepa* var. *luteum* Alef., *A. cepa* var. *multiplicans* L.H.Bailey, *A. cepa* var. *portanum* Alef., *A. cepa* var. *praecox* Alef., *A. cepa* var. *proliferum* (Moench) Regel, *A. cepa* var. *rosun* Alef., *A. cepa* var. *sanguineum* Alef., *A. cepa* var. *solaninum* Alef., *A. cepa* var. *sylvestre* Regel, *A. cepa* var. *tripolitanum* Alef., *A. cepa* var. *viviparum* (Metzg.) Alef.

3. Systematic Position:

APG IV (2016)

- Kingdom: Plantae
- Clade: Angiosperms
- Clade: Monocots
- Order: Asparagales Link
- Family: Amaryllidaceae J. St.-Hil.
- Subfamily: Alliioideae Herb.
- Genus: *Allium* L.
- Species: *A. cepa* L.

Bentham and Hooker (1862)

Kingdom: Plantae
Division: Phanerogamia
Class: Monocotyledones
Series: Coronarieae
Ordo: Liliaceae Juss.
Genus: *Allium* L.
Species: *A. cepa* L.

4. Distribution:

Global: Extensively cultivated throughout India and other countries

India: Extensively cultivated throughout India

5. Indigenous/Exotic/ Endemic; Cultivated/Wild: Cultivated

6. Threat Status:

IUCN: Not been assessed yet

BSI:

7. Habit and Habitat: Herbaceous, height~ 50-70 cm; Temperate

8. Life Form: Bulbous geophyte

9. Economic Importance: Spice and vegetable

10. Probable Progenitor of: *Allium fistulosum* and *Allium cepa* are regarded as the progenitors of triploid *Allium cepa* var. *viviparum* ²⁵

11. DNA

C- value

1C (16.9pg)¹¹⁵

1C (16.4pg)¹¹⁶

Methodology

Feulgen Cytophotometry^{1,80}

Flow cytometry^{81,115,116,217}

2C (33.50pg)¹¹⁴
2C (33.8pg)¹¹⁵
2C (32.7pg)¹¹⁶
2C (32.4±0.2pg)²¹⁷
3C (50.6pg)¹¹⁵
3C (49.1pg)¹¹⁶
4C (67-71.61pg)¹
4C (66.40-69.00pg)⁷⁸
4C (60.60pg)⁷⁹
4C (67.00pg)⁸⁰
4C (63.38-65.44pg)⁸¹
4C (67.00pg)¹¹⁴
4C (67.5pg)¹¹⁵
4C (65.4pg)¹¹⁶

12. Basic chromosome number(s): $x=8^{23,184,217}$

13. Zygotic chromosome number(s): $2n=14^{169}$

$2n=16$

1,2,7,9,11,13,14,18,19,20,21,22,23,24,26,27,28,29,78,79,80,81,82,90,92,93,95,114,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135

$2n=24^9,13,14,23,24,25,26,173,174$

$2n=28^{169}$

$2n=32^{149}$

14. Gametic chromosome number(s): $n=6^{180}$

$n=8^{2,11,18,19,21,22,181}$

15. Specialized chromosomes (B chromosomes/Sex chromosomes/Polytene chromosomes/Neocentric chromosomes):

Image file

16. Ploidy level: Diploid^{1,2,3,7,11,18,19,20,21,22,23,24,25,26,78,79,80,81,82,114,115,116,174,184,217}, Triploid^{23,24,25,26,174}

Image file

17. Agametoploidy

18. Nature of polyploidy (auto, segmental, allo, autoallo): Autotetraploid¹⁴⁹

19. Genomic formula: Triploid- AAB²⁴, AAA'²⁵

20. Aberrant chromosome number(s) (aneuploidy, aneusomaty, polysomaty):

21. Somatic chromosomes:

Karyotype Majority metacentric chromosomes^{2,20,23,82,90,152,174,178,184}

Majority metacentric to submetacentric chromosomes^{143,149}

In Diploid: Majority meta-/submetacentric chromosomes^{24,26}; medium to large²⁶; 1-2 NOR^{24,26}

In Triploid: Majority meta-/submetacentric chromosomes²³⁻²⁶; Karyotype split in 2 sets (8 pairs+8 singles)²³⁻²⁶; large²³ or medium to large²⁶; 1-2 NOR^{24, 25,26}

Chromosome size Small^{20,82,149}, large²³, very large¹⁸⁴

NOR chromosome(s) 1 NOR^{131,152,174}, 2 NOR^{2,22,23,90,143,149,152,174,177,184}, 3 NOR^{90,152}, 4NOR^{90,152}

Degree of asymmetry: Symmetrical^{2,82}

Image file

22. Banding pattern(s): Giemsa C-Bands located at telomeres^{30,143,152,174}, Giemsa intercalary C-Bands^{143,174}, Giemsa C-Bands at distal region¹⁴⁵, Giemsa C-Bands located at centromere and satellites¹⁷⁴, CMA/DAPI/AMD banding at NOR and telomeric region¹⁷⁷

Image file

23. Physical mapping of chromosomes:

In situ hybridization 18S, 5.8 S and 25S rDNA localization by ISH¹⁶¹

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Fluorescent in situ hybridization 45S and 5S rDNA localization by fiber FISH⁷⁶, 45 S and 5S rDNA, telomeric tandem repeats and Cot-1 DNA localization by dual color FISH¹⁸⁴, localization of 375bp repeat sequence by FISH¹⁸³

Image file

24. Genomic in situ hybridization:

Image file

25. Linkage map:

Image file

26. Chromosome associations:

Female meiosis

Male meiosis 8 II^{2,11,178}, 16 I or 8 II or 1-6 II+4-14 I¹⁸, IV's of 2 translocated and 2 normal chromosomes¹⁹, PMC with 16, 16+1small chromosome, 18 and 20 chromosomes forming multivalents (III's to VI's) in addition to II's²¹. High variability, 8 II or 3-4 II+rest I's or 2-4 I+rest II's²², 7II+2I¹⁷⁸

In triploid: I's, II's and multivalent present, majority of PMCs had 1-7 III in addition to II's²⁵

Image file

27. Chromosome distribution at anaphase I: Normal¹¹; Unequal chromosome disjunction, lagging and precociously dividing chromosomes reported in the desynaptic plant¹⁸; Irregular^{19,21,22}, Unequal²⁵, A pair of bridges and two fragments¹⁴⁹

28. Genetic diversity:

Chromosomal level

Image file

DNA level : 74,75,77

29. Any other information (Apomixis; Inversion; Male sterility; Pollen grain mitosis; Pollen stainability; Translocations etc):

Translocation heterozygote¹⁹, Pollen stainability (%): 7%¹⁸, 9-22%¹⁹, 4.5%²¹, 83-95%²², 10%²⁵, Pollen grain mitosis revealed 16 chromosomes in most of the tetraploid material¹⁴⁹, Pollen grain mitosis revealed 14 chromosomes in some tetraploid material¹⁴⁹