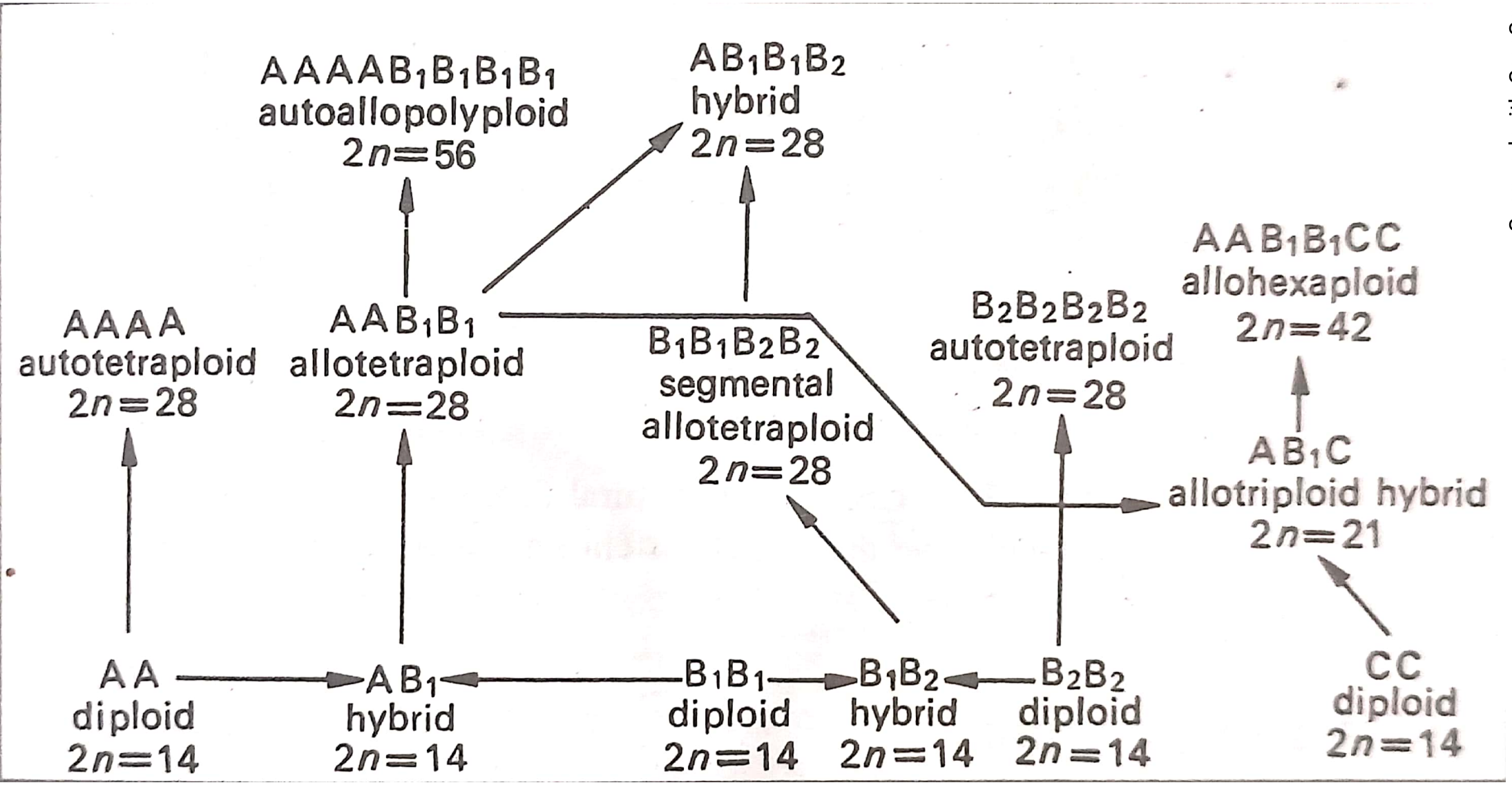

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(III) Triticum aestivum

Triticum dicoccum (Tetraploid wheat) × Aegilops squarrosa (Goat grass)

$2n = 28$ AA BB ↓ $2n = 14$ DD

ABD
Triploid Hybrid ($2n = 21$)

↓

AABBDD
(Triticum aestivum) ($2n = 42$) (Allohexaploid)

(IV) Nicotiana

Nicotiana tabacum × Nicotiana glutinosa

$2n = 48$ ↓ $2n = 24$

F_1 Hybrid
($2n = 36$)

↓ Colchicine

Nicotiana diglutа
($2n = 72$)

Significance of Polyploidy

- Autopolyploids change the size of fruits and pollens.
- It ↑es the osmotic concentration.
- Polyploidy changes the annual plants to perennial.
- Allopolyploids suggests how new species arises by cross between two species.
- New varieties of plants can be produced.
- Scientists have developed hybrid varieties of wheat, Paddy, Maize, vegetables, fruits, flowers, cereals, pulses etc.

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eg: Raphanobrassica

Raphanus (Raddish) (2n = 18) × Brassica (Cabbage) 2n = 18

↓

F_1 2n = 18 (9R + RB)

↓ Colchicine

4n = 36 (18R + 18B)

Tetraploid (Raphanobrassica)

Origin 1) By Abnormal Meiosis

2) By Abnormal Mitosis

Examples of Polyploidy

1) Raphanobrassica discussed above

II) Gossypium Hirsutum (American Cotton)

Gossypium herbaceum (Old world Cotton) 2n = 26 (Small chr) × Gossypium raimandii (New world Cotton) 2n = 26 (large chr)

↓

F_1 Hybrid 2n = 26

13 small chr + 13 large chr

↓ Colchicine

Gossypium Hirsutum (2n = 26)

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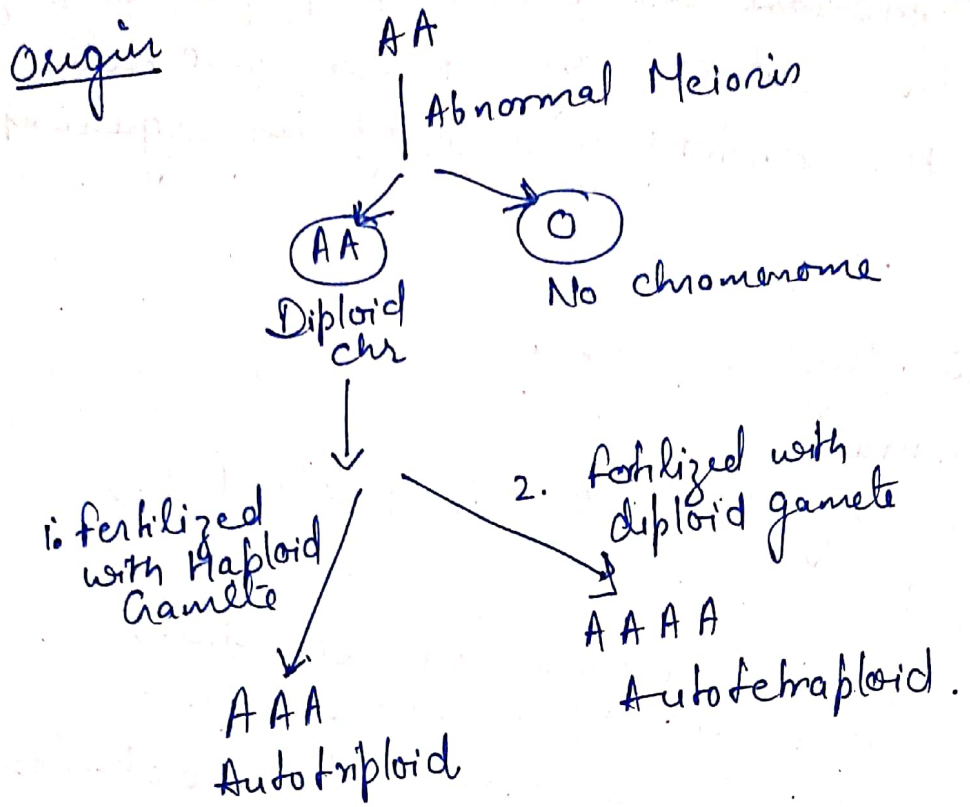
Origin

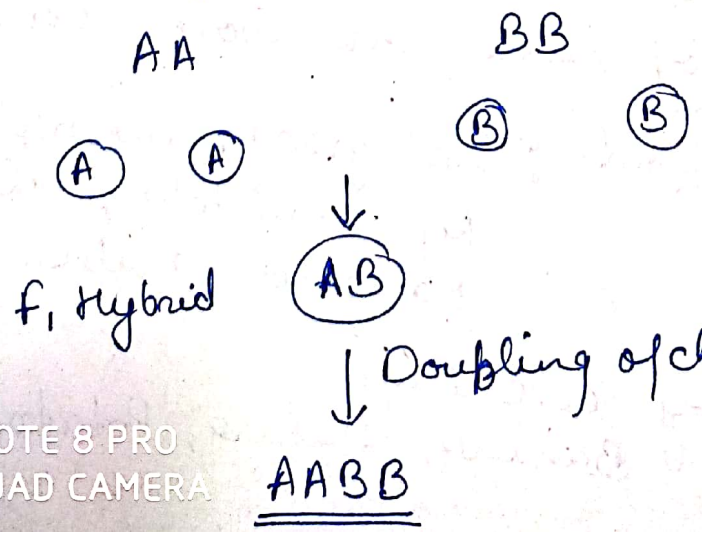


Characteristics

1. Larger than diploid due to ↑ cell size.
2. Show vigrous growth.
3. Delayed flowering but large flowers
4. Seeds are few by Large.
5. slow Growth rate
6. less resistant to frost.

2. Allopolyploids

- Allopolyploids have two or more distinct genomes.



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B) **Polyploidy** Increase in chromosome number by the addition of one or more sets to the diploid genome of an organism.

occurrence

- frequent in Higher plants
- rare in Animals
- wheat (4n) rye (6n) American cotton (4n)
- Grant (1971)
  - Polyploidy is rare among animals, fungi, most gp. of gymnosperms.
  - It is frequent in angiosperms, pteridophytes.
  - It is found in Rotifers.

Types

A) On the basis of No. of chr set

Triploids (3n), Tetraploid (4n), Pentaploid (5n) Hexaploid (6n), Heptoploid (7n), Octaploid (8n)

B) On the basis of Source of chr set

1. Auto polyploids
   - Single genome repeated more than twice.
   - duplication of same chromosome complement

Natural Autopolyploids : Doob grass (autotriploid)
Rye (autotetraploid)
Marigold, grapes, apple

Artificial : by colchicine
Banana, Datura, Potato etc.

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- Haploidy is normal in lower eukaryotes and in all prokaryotes
- Rare in Higher Eukaryotes
- Some Hymenopterous Insects (bees, wasps, ants) have haploid males, their females & sterile workers are all diploid.
- Male haploids are produce due to parthenogenesis.
- Androgenic Haploids – Haploids orginated from Pollen tube rather than egg, synergids or antipodal cells.
- Artifically Haploids are produced by:
  (I) X-ray treatment
  (II) Temperature shocks
  (III) Colchicine treatment
  (IV) Hybridization
  (V) Anther or pollen culture
- Important use of Haploids is in production of Homozygous diploids by Colchicine treatments

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Aneuploidy and Polyploidy

(Dr. Neha Antal) ①

Haploid — have only one set of chr (n)

Diploid — have two sets of chr (2n).

Aneuploidy and Polyploidy comes under Numerical chromosomal changes.

- I. Euploidy (change in Entire set of chr)
  - Haploidy / Monoploidy
  - Polyploidy
    - Autopolyploidy
    - Allopolyploidy
    - Amphipolyploidy
- II. Aneuploidy (change in no. of chr in a set)
  - Monosomics
  - Polysomics
    - Trisomics
    - Tetrasomics
  - Nullisomics

I. Euploidy

Loss or addition of complete one or more sets of chromosomes.

A) Monoploidy

Individuals having one sets of chr Monoploids | Haploids

This condition is called Monoploidy | Haploidy

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