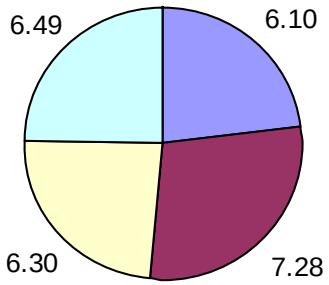
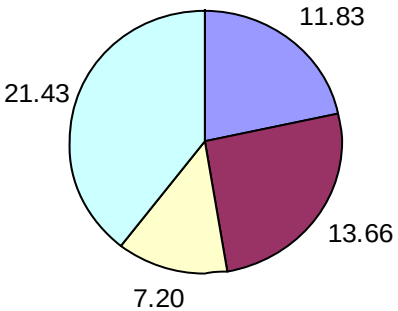
REPEAT POLYPLOIDIZATION WITH A NEW NUCLEAR PARTNER GENOME CAN RESULT IN VERY SIGNIFICANT GENOMIC AND MORPHOLOGICAL CHANGES IN BRASSICA DIGENOMICS: *B.JUNCEA* AS AN EXAMPLE

S. S.BANGA

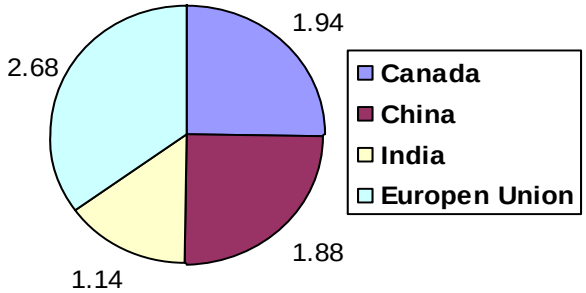
RAPESEED - MUSTARD



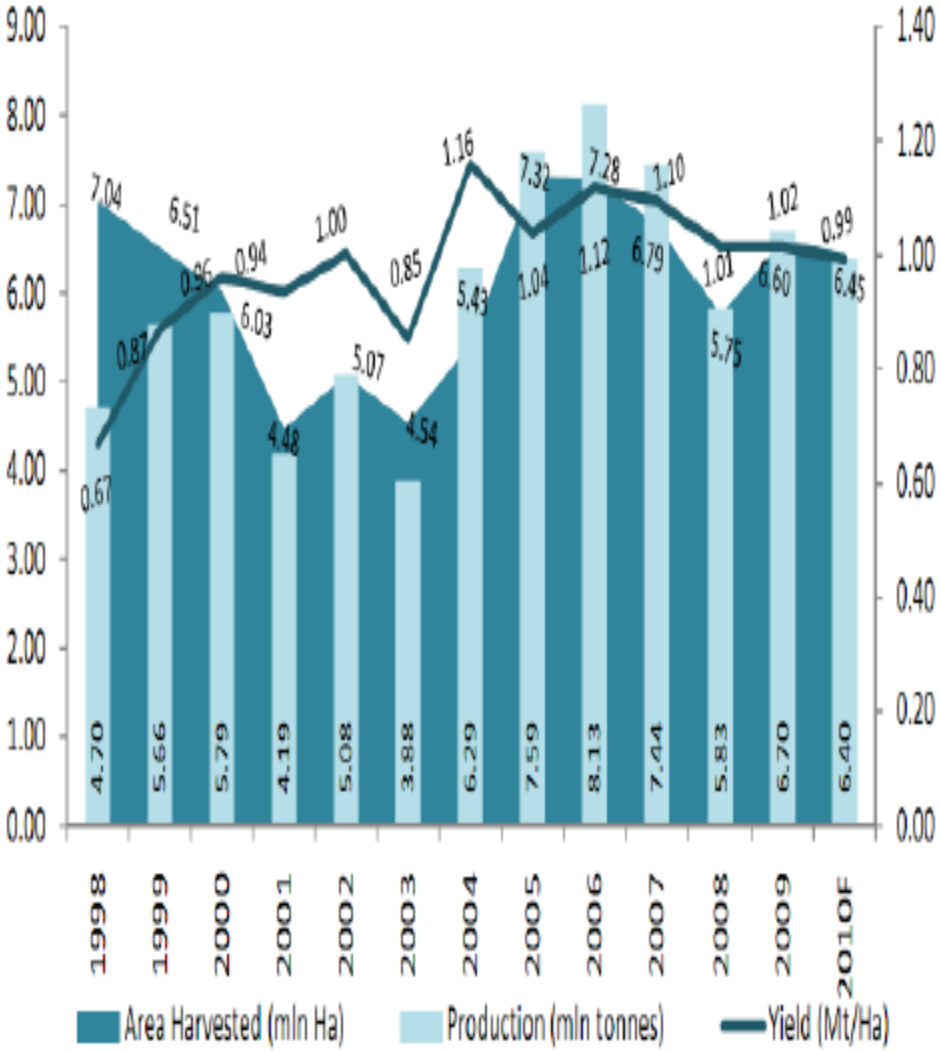
Area (million ha)



Production (million tonnes)



Productivity (t/ha)



TECHNICAL INEFFICIENCES IN MUSTARD

Plant architecture

Indeterminate
Generally tall
Large Biomass
Low Harvest Index

Photosensitivity

Low Productivity

Heterosis : Low
Oil : ?

NUE : Low
PUE : Low

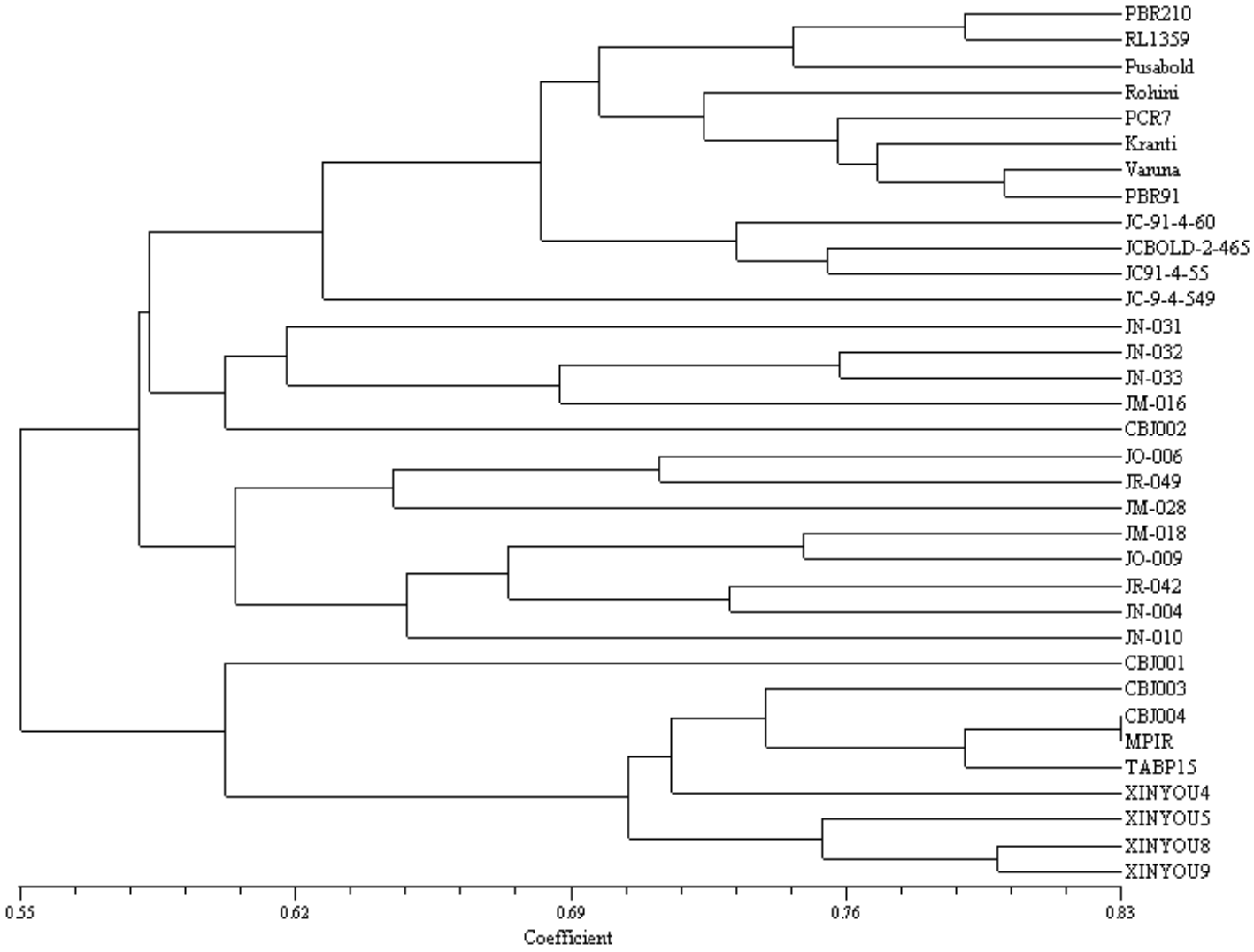
Biotic stresses

White rust
Alternaria Blight
Sclerotinia
Powdery mildew
Downey mildew
Mustard Aphid

Abiotic Stresses

Temperature
Water

GENETIC DIVERSITY IN MUSTARD



POSSIBLE STEPS FOR A BRASSICA GERMPLASM ENHANCEMENT

- **Mobilizing left out genetic variation still available in land races , wild and weedy species.**

- **Replaying the evolutionary tape(resynthesis in polyploids):**

  Direct from parental diploids

  Indirectly from related digenomics

RESYNTHESIS FROM RELATED DIGENOMICS : RATIONALE ?

- **At least one basic diploid progenitors (C/B) normally used to resynthesize digenomics is of poor breeding value.**

- **Natural digenomics in contrast are of excellent breeding value.**

- **Creation of new combination of genomes, which have previously evolved with different nuclear partner(s) was considered possible.**

  For example :

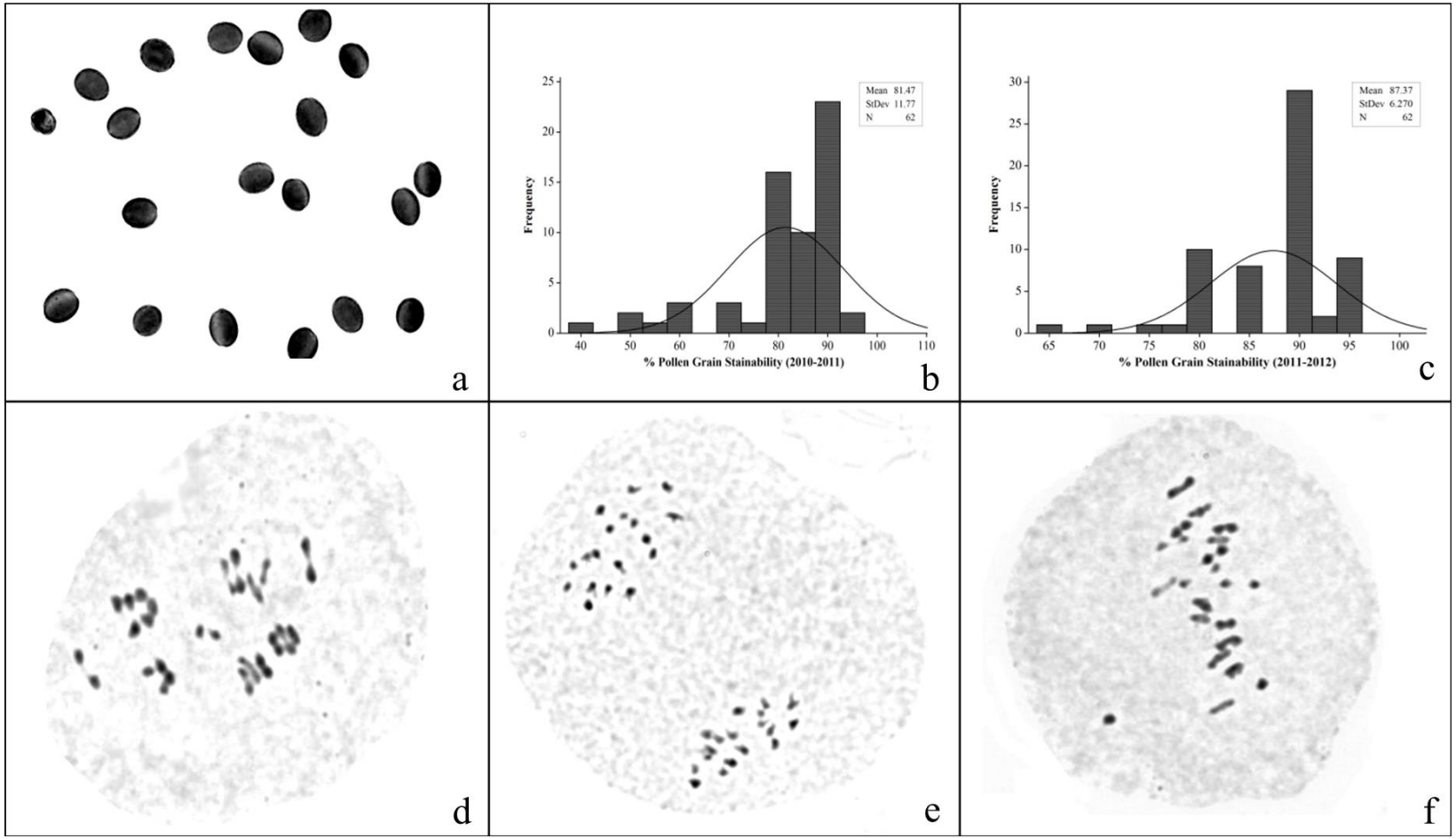
  ***B.napus*(AACC) x *B.carinata* (BBCC) = *B.juncea*(AABB)**

Such a combination was expected to unleash the process of diploidization , perheps stronger than in polyploids resynthesized from diploid progenitor parents.

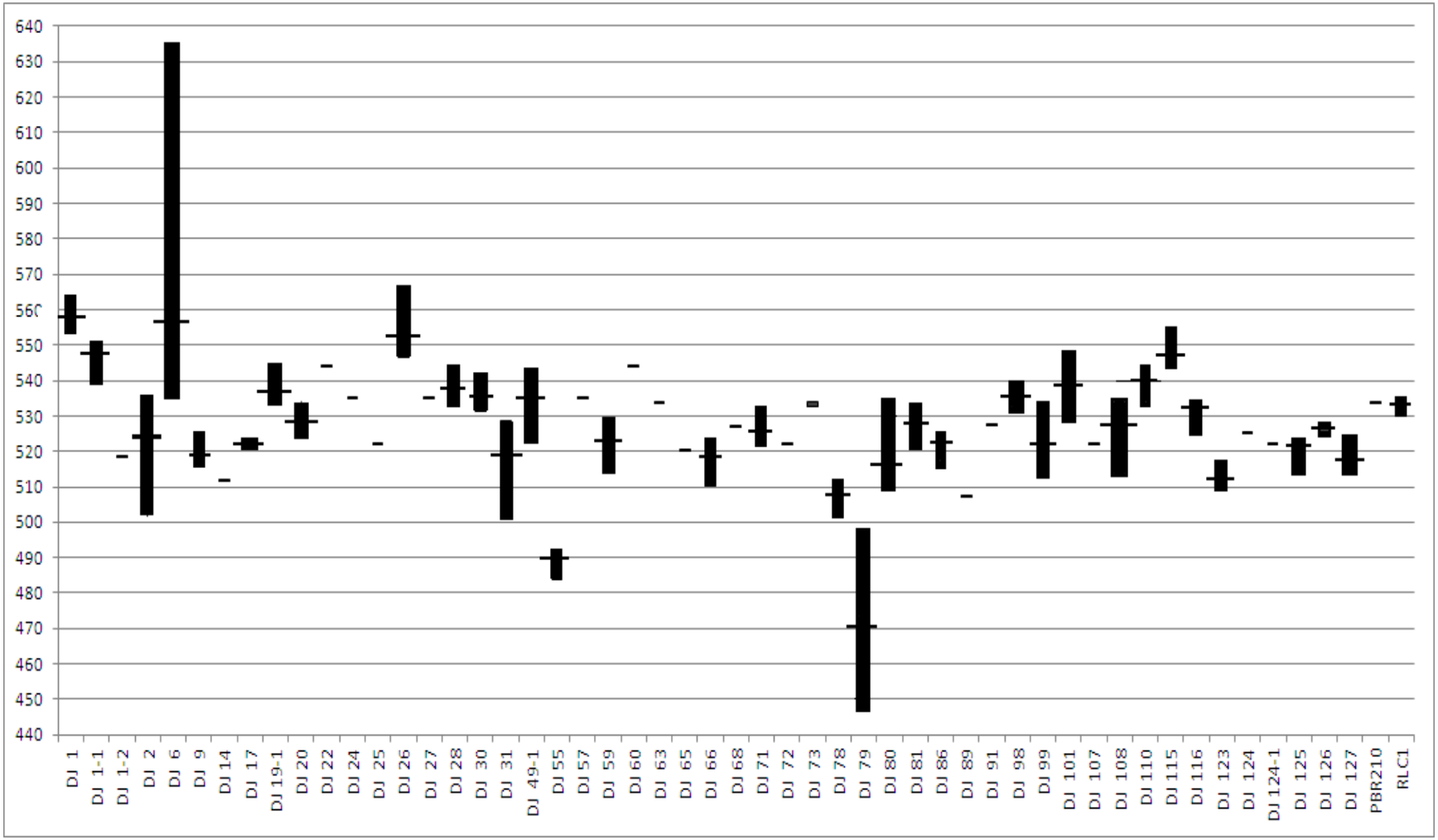
Altered Nucleo-cytoplasmic interactions.

Seamless transfer of variation across species domains.

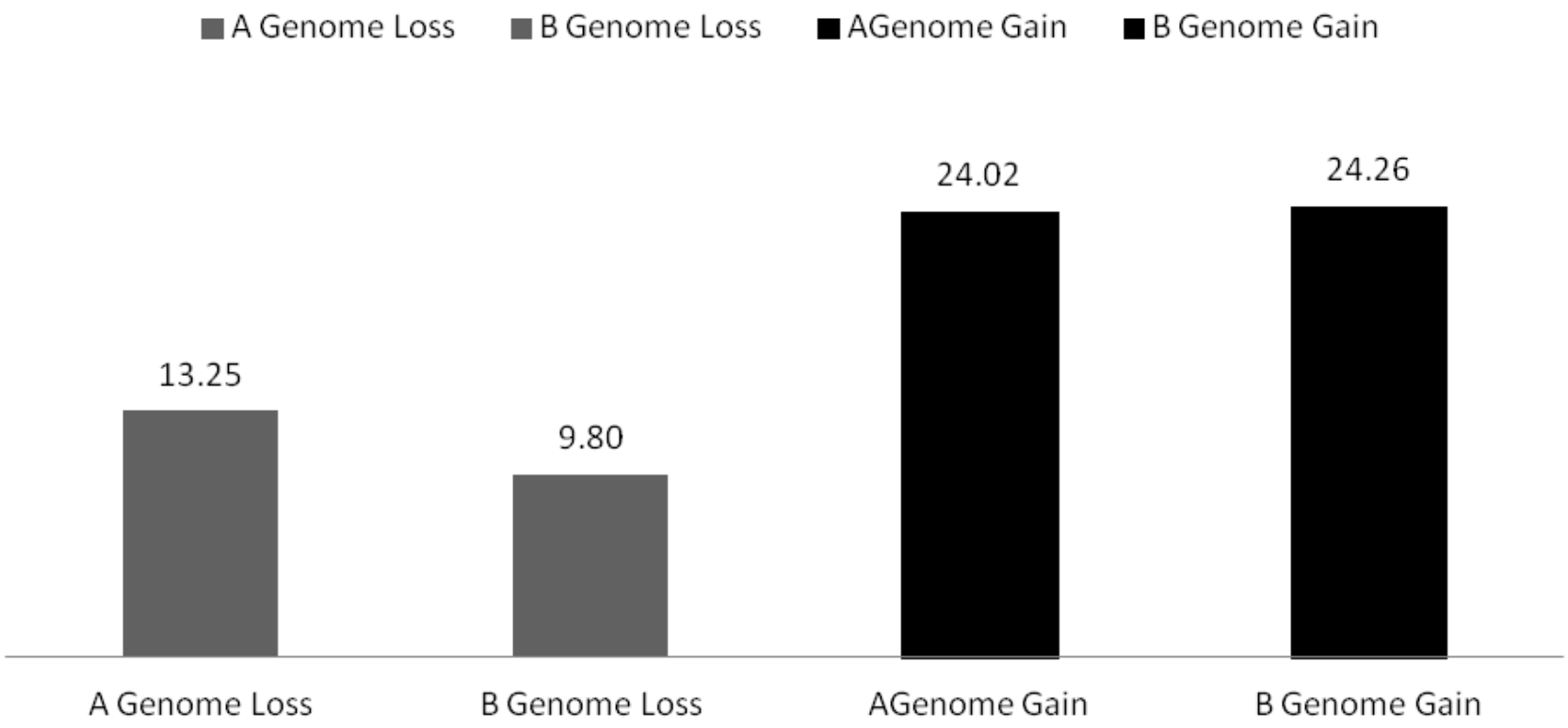
FERTILITY AND MEIOTIC STABILITY



GENOME SIZE VARIATION IN NEWLY SYNTHESIZED DERIVED *B. JUNCEA* AMPHIPLOIDS



GENOME MODIFICTIONS

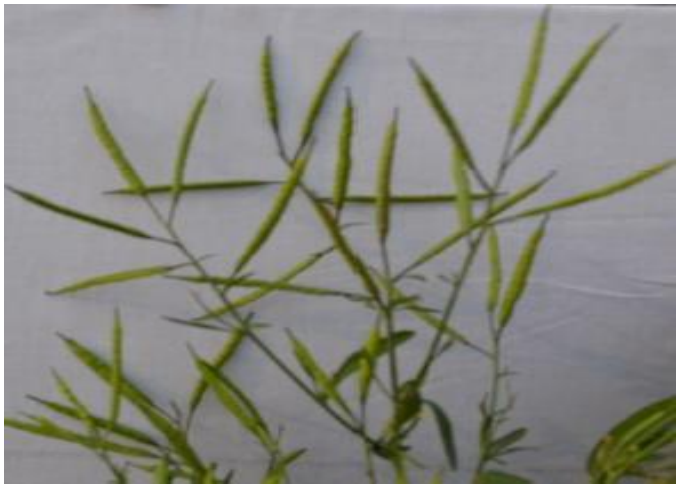


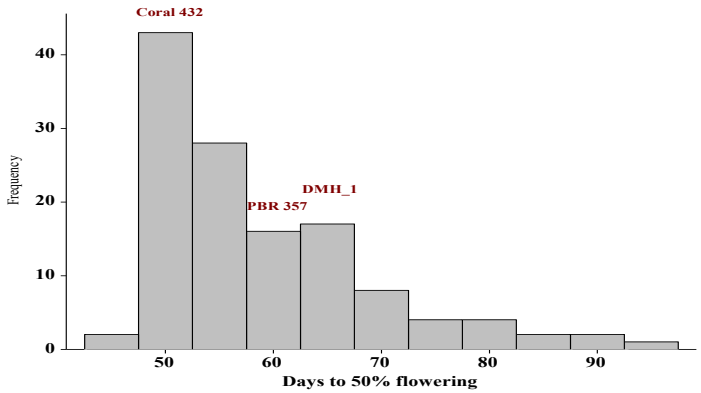
POPULATION STRUCTURE ANALYSIS OF DERIVED BRASSI*CA JUNCEA*

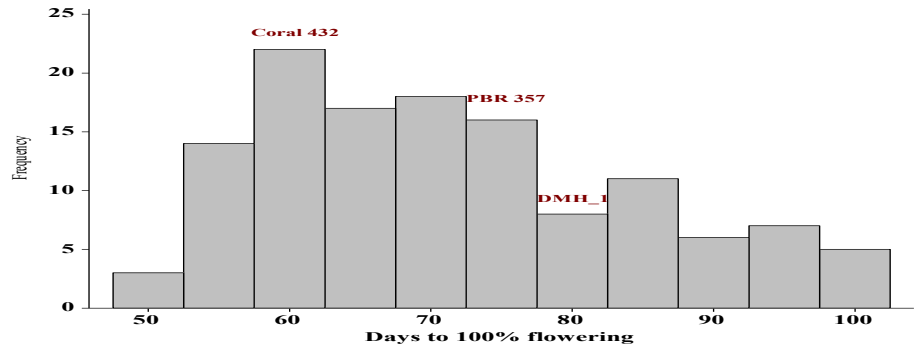
DERIVED AMPHIPLOIDS : PRACTICAL POSSIBILITIES

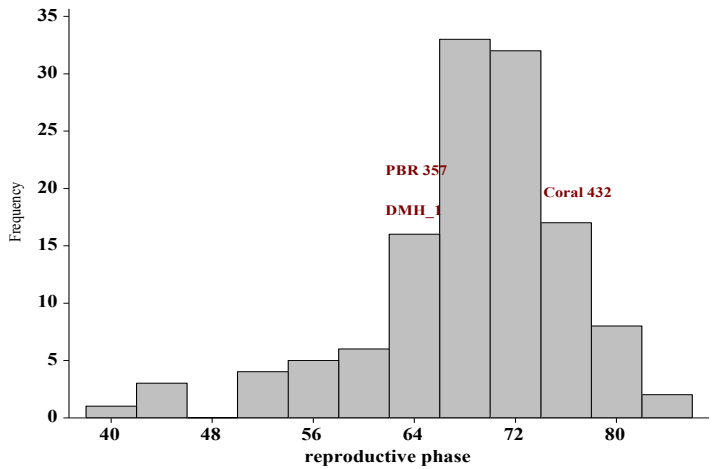
PLANT TYPE VRIANTS

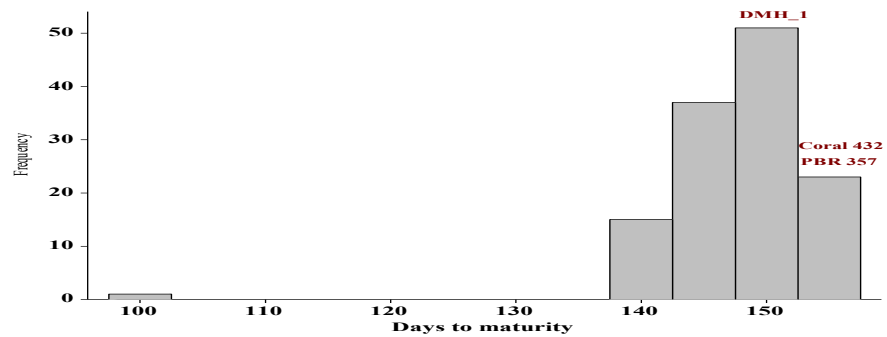
DETERMINATE MUSTARD





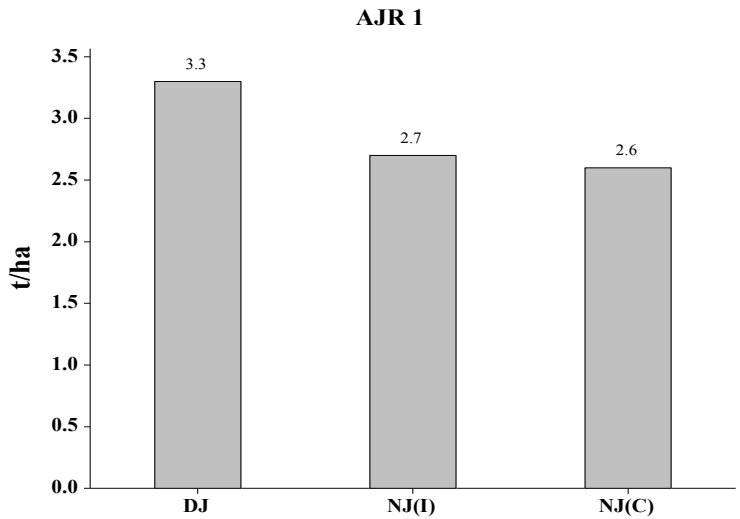


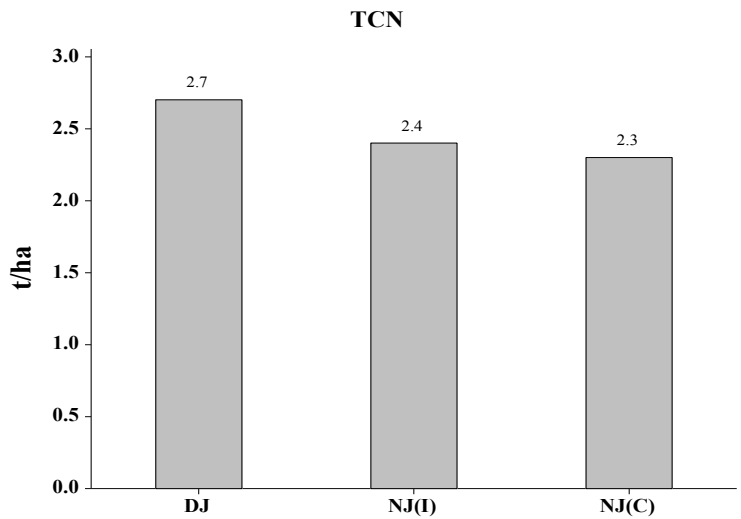




LIFE HISTORY TRAITS IN DETERMINATE MUSTARD

PRODUCTIVITY OF CMS BASED MUSTARD HYBRIDS DEVELOPED BASED ON POPULATION STRUCTURE





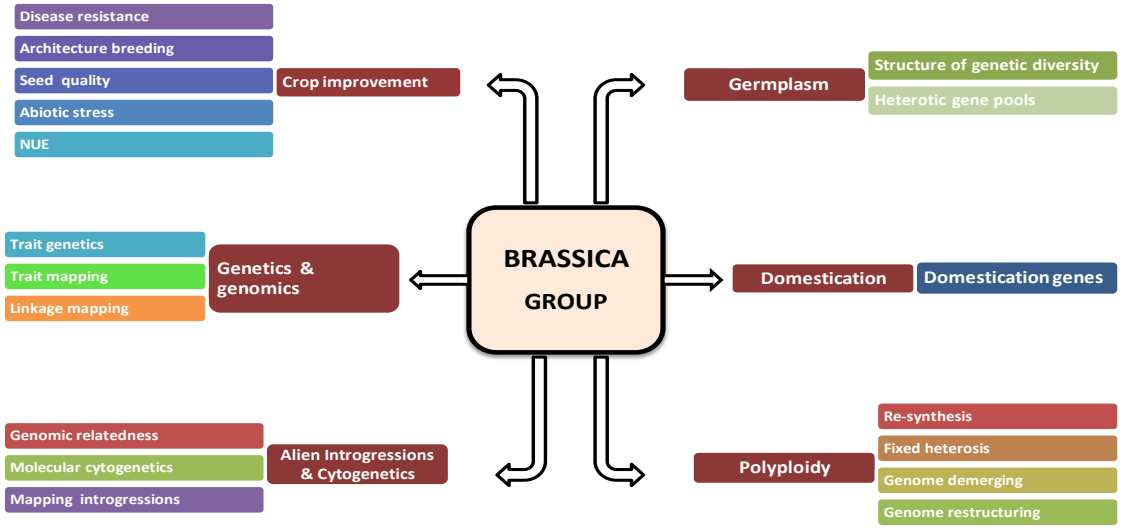
Based on Averages of over 100 hybrids in large scale testing

ALSO DETERMINATE DERIVED *BRASSICA NAPUS* !

Indeterminate

Determinate

THANKS


Disease resistance
Architecture breeding
Seed quality
Abiotic stress
NUE
Crop improvement
Germplasm
Structure of genetic diversity
Heterotic gene pools
Trait genetics
Trait mapping
Linkage mapping
Genetics & genomics
BRASSICA GROUP
Domestication
Domestication genes
Genomic relatedness
Molecular cytogenetics
Mapping introgressions
Alien Introgressions & Cytogenetics
Polyploidy
Re-synthesis
Fixed heterosis
Genome demerging
Genome restructuring