henotypic Characterization of EMS Induced Mutants in Wheat (*Triticum aestivum* L.)

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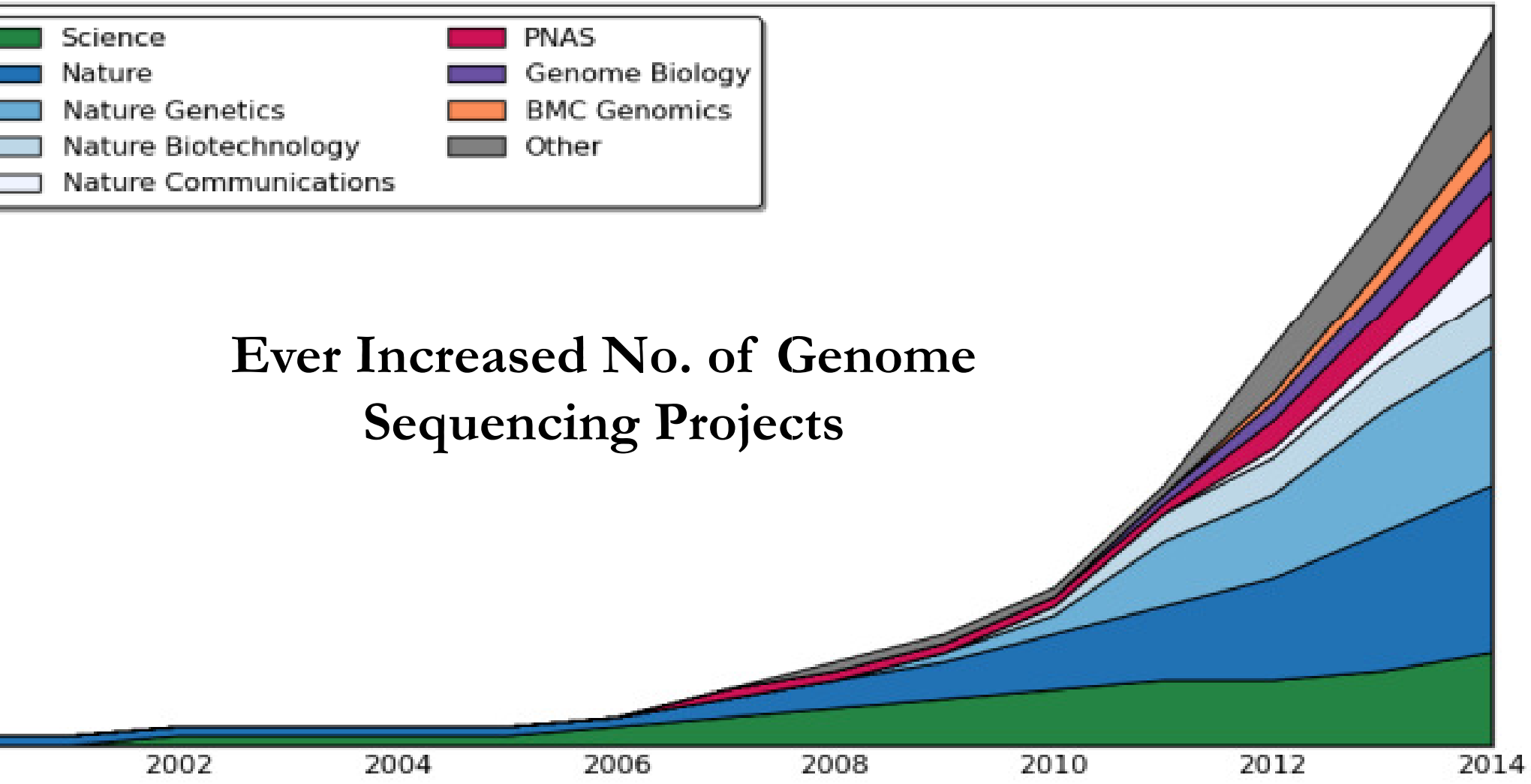
Karnal (Haryana)

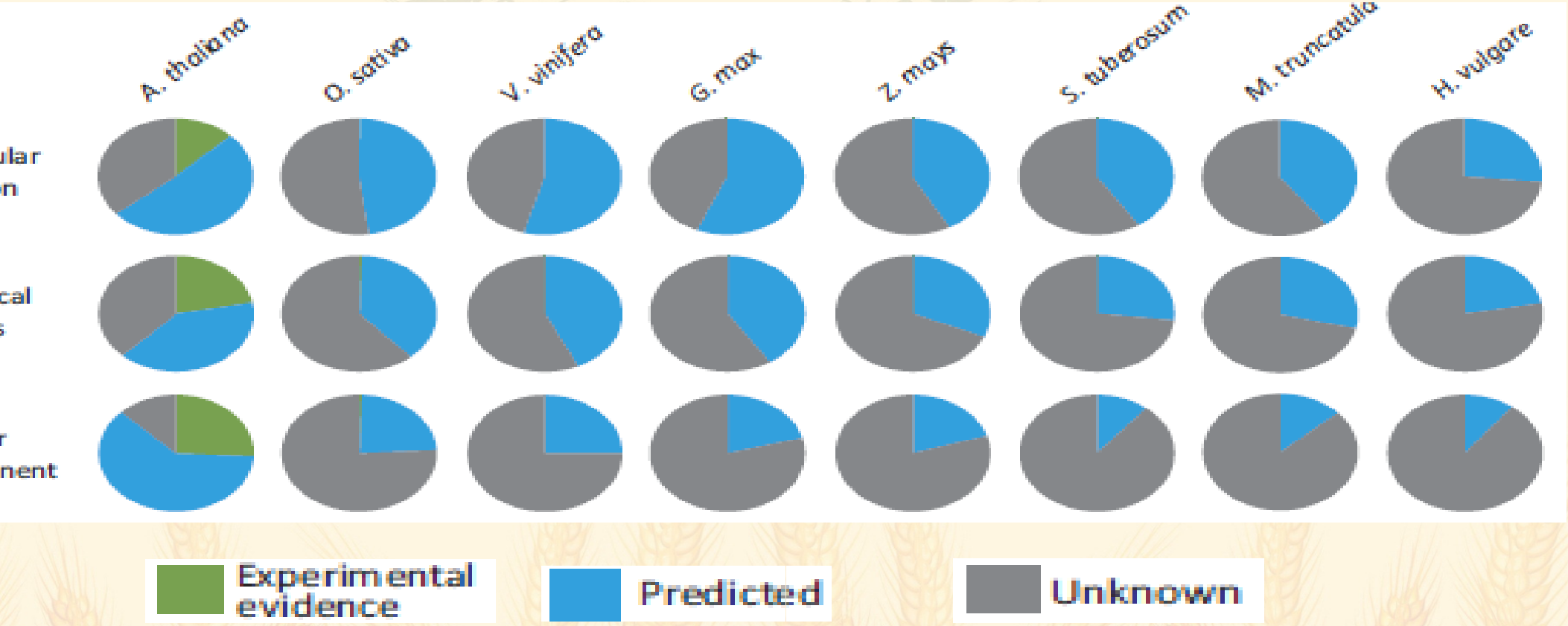
Relevance of Mutant Phenotypes



Ever Increased No. of Genome Sequencing Projects

Trends in Plant Science April 2014, Vol. 19, No. 4

Large No. of genes are Unknown



Only 9% of genes in Arabidopsis are experimentally proven

Most of the genes in all other sequenced genomes are only predictions

***E. Coli* (43%) and in *S. cerevisiae* (30%)**

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Material and Methods

DPW-621-50 : Released for IR-TS conditions of NWPZ

Treated with 0.7 % ethyl methanesulfonate (EMS) at DWR, Karnal.

4000 mutants generated

600 M_2 plants studied for altered phenotypes: IPGRI wheat phenotype descriptors.

Traits Studied

Phenology

- Days to heading
- Days to Maturity
- Colour/pigmentation
- Height

Floral mutants

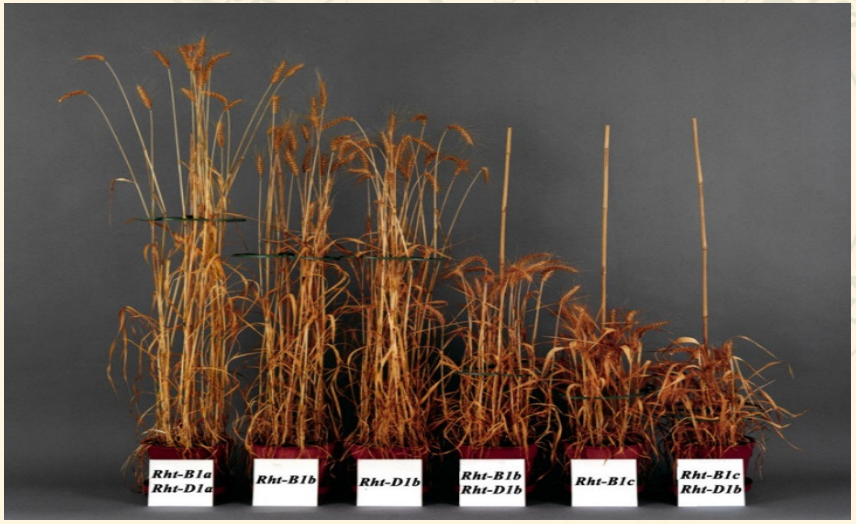
- Spike length
- Symmetry
- Threshability
- Floral parts

Yield Traits

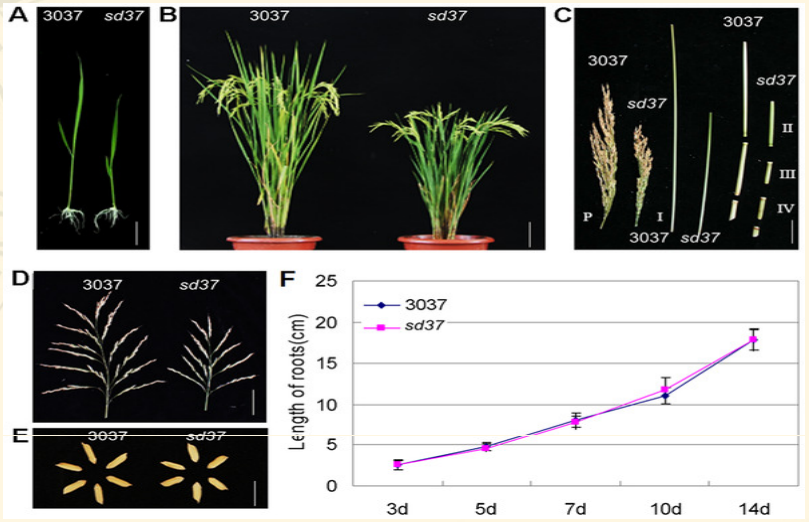
- Color
- Size
- Shape

Results: Altered Phenotypes

t mutant



Wheat: Plant Height



Rice: Plant Height

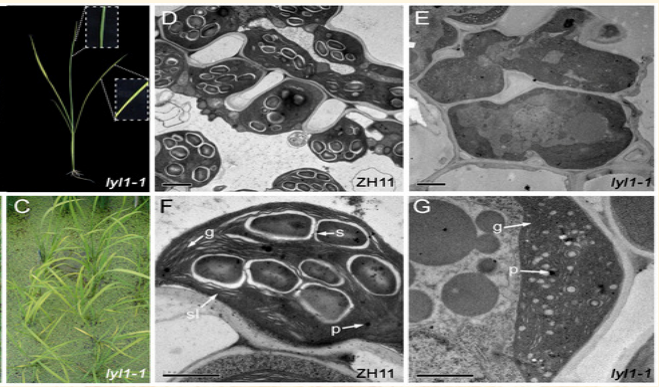
Range: 15 -150 cm

Zhang J, Liu X, Li S, Cheng Z, et al. (2014) The Rice Semi-Dwarf Mutant sd37, Caused by a Mutation in CYP96B4, Plays an Important Role in the Fine-Tuning of Plant Growth. PLoS ONE 9(2

Results: Altered Phenotypes

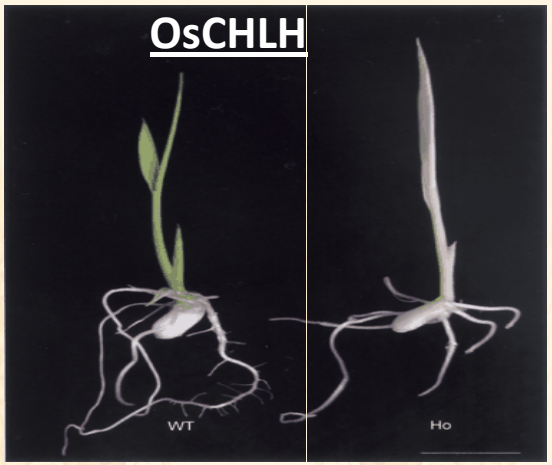



Chlorophyll mutants

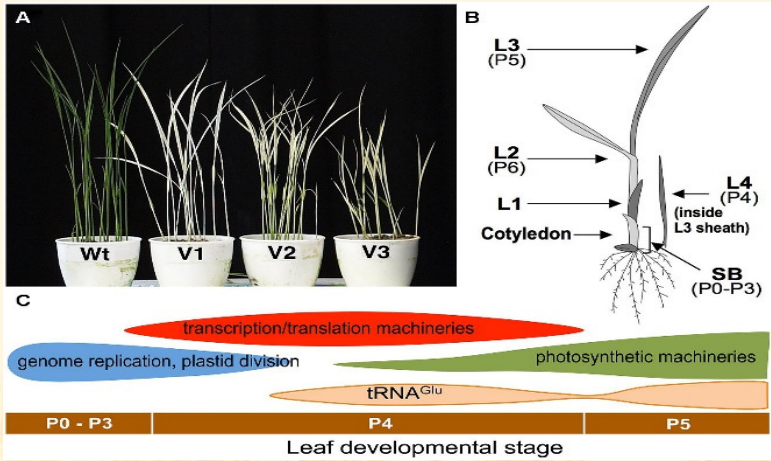


Light-Induced Yellow Leaf 1 Gene

w.plosone.org/article/info:doi/10.1371/journal.pon

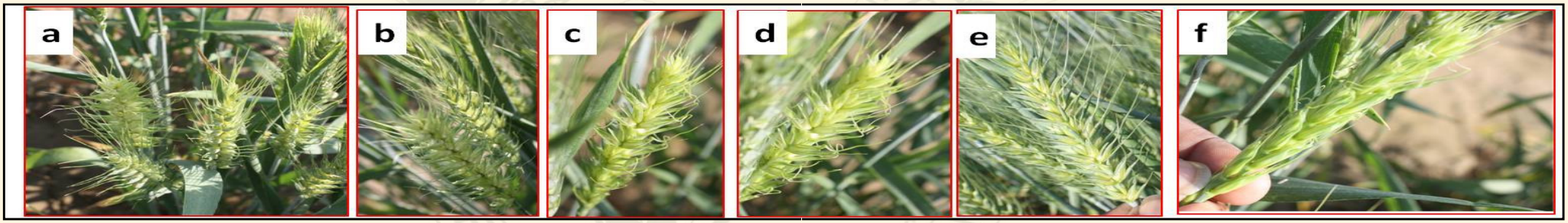


Plant Cell Physiol (2003) 44 (5): 463-472.



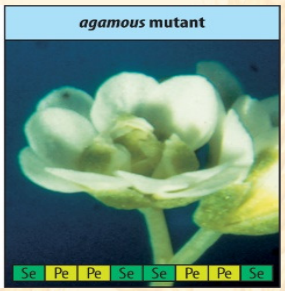
Front. Plant Sci., 11 August 2014 | doi: 10.3389/fpls.2014.00386

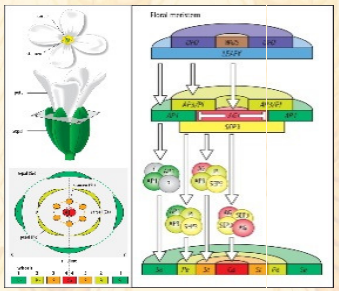
Spike Variations

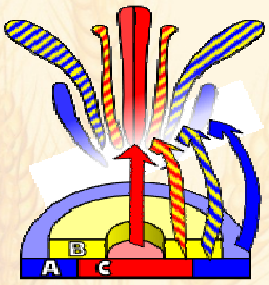


Open floret, deformed glume, twisted awns etc..

Spikelet symmetry variations







ABCDE model of flower development

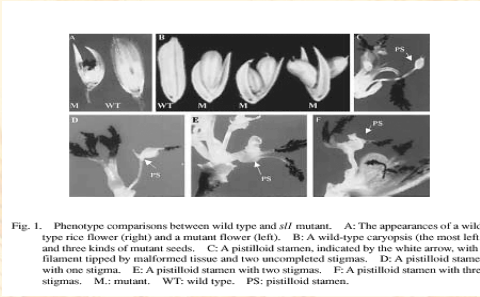


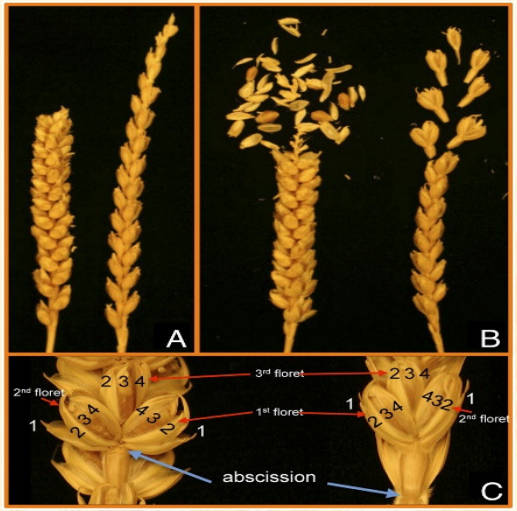
Fig. 1. Phenotype comparisons between wild type and *sll* mutant. A: The appearances of a wild type rice flower (right) and a mutant flower (left). B: A wild-type caryopsis (the most left and three kinds of mutant seeds. C: A pistilloid stamen, indicated by the white arrow, with filament tipped by malformed tissue and two uncompleted stigmas. D: A pistilloid stame with one stigma. E: A pistilloid stamen with two stigmas. F: A pistilloid stamen with thre stigmas. M.: mutant. WT: wild type. PS: pistilloid stamen.

Stamen less mutant of Rice

S. and E.M. Meyerowitz, 1991. The war of the whorls: genetic interactions controlling flower ment. Nature **353**: 31-37.

Spike Variations

Threshability: Easy and Hard

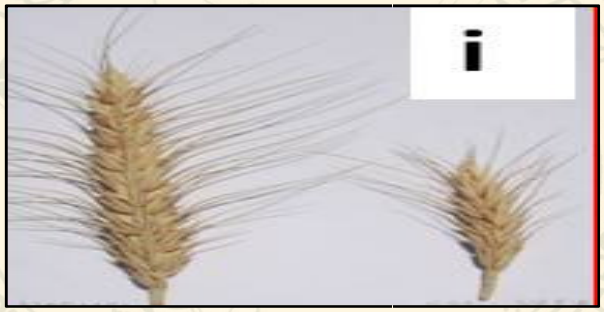


Free threshing Q gene mutants in wheat

Q gene copy no variations

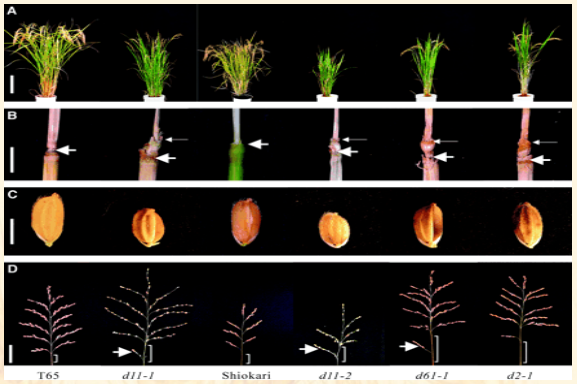
Zhang Z et al. PNAS 2011;108:18737-18742

Spike Variations



Spike length variations

Range: 2 -18 cm



Rice: dwarf11 loci mutants

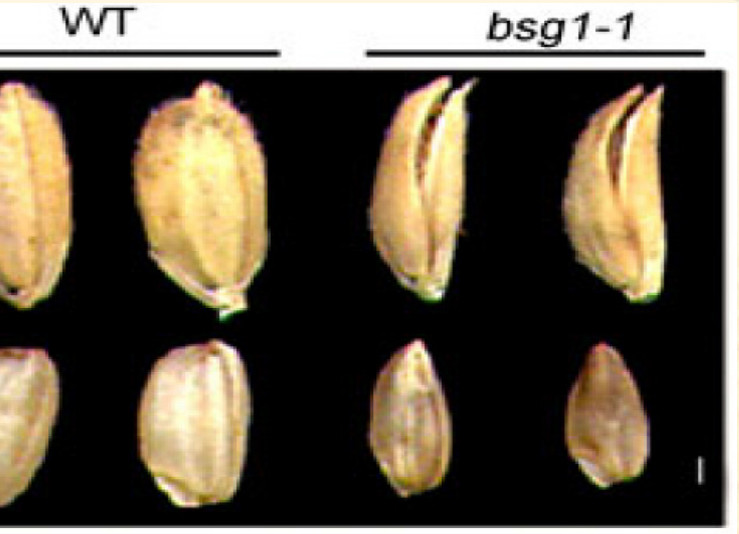
Brasinosteroid biosynthesis pathway

The Plant Cell March 2005 vol. 17 no. 3 776-790

***Q* gene mutants in wheat**

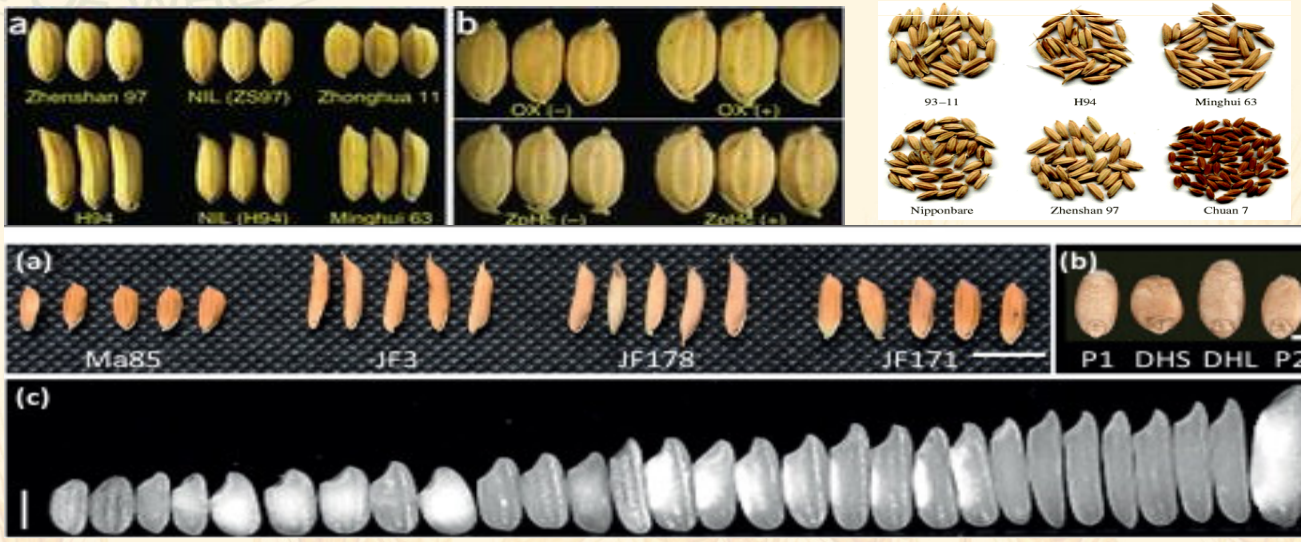
Source-Sink Variations

Shrivelled and unfilled grains



Beak Shaped Grain mutant

ki.big.ac.cn/index.php?title=Os02g0811000&oldid
st update: May 27, 2014)



GS5 encodes a putative serine carboxypeptidase and functions as a positive regulator of grain size

Conclusions

dentified altered phenotypes for a large number of traits

Role in breeding for wheat improvement (High Tiller and Bold grain mutants)

Understanding the functional basis of genes

Openness of spikelet's and male sterility could possibly find role in hybrid wheat development

Acknowledgements

- Omics Group
- Research fellows
- Colleagues at DWR-Karnal

Thank you