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Isolation and preliminary characterization of a new maize *low phytic acid 1* allele

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Phytic acid, myo-inositol 1,2,3,4,5,6-hexakisphosphate (IP6), is the major storage form of phosphorous in plants, it's mainly accumulated in pollen and seeds (up to 4-5% of dry weight). In maize kernel the 80% of phytic acid is localized in the scutellum while the remaining 20% in the aleuronic layer. During germination phytic acid is idrolized by phytases. Both phytic acid and the cations that it's able to bond are poorly bio-available for monogastric animals due to their lack of phytase activity. One strategy to solve this problem is the isolation of cereal mutants able to accumulate low level of phytic P and high level of free phosphate in the seeds.

We obtained a mutant population by the EMS (ethyl methanesulfonate) seed-treatment and approximately 300 M2 families were screened using the molybdate staining method for free phosphate.

We found one *low phytic acid 1* mutant (named *lpa1-7*); the 3:1 segregation ratio of *lpa1-7*, observed in the F2 generation, indicated a monogenic recessive defect (Tab. 1).

The *lpa1-7* mutation causes approximately a ten fold increase in the amount of free phosphate (Fig. 1) and a reduction of about 80 % of phytic acid (Fig. 2); the presence of this new allele in homozygous condition is lethal. Germination could be partially restored by embryo-rescue, embryos from mature seeds cultured in MS medium grew slower than the wild type and some defective seedlings were observed. Mutant embryos displayed a reduction in dimension and alteration in the alignment of the shoot and root primordia.

The relationship of our low phytic acid mutation with the previously identified *low phytic acid* maize mutations was tested. It's known that the *lpa1* mutant is the only low phytic acid mutant exhibiting more than 60% of reduction of phytic acid, the rate of reduction shown by *lpa1-7* acid

suggested that it could be an *lpa1* allele. The mutants *lpa1*, *lpa2* and *lpa1-7* were crossed inter se in all pairwise combinations to assay their pattern of complementation. The results obtained showed that the *lpa1* mutant failed to complement *lpa1-7*, suggesting its allelic nature (Tab. 2).

Genetic analysis of this mutation, as well as its biochemical characterization are under way.

	Genetic test	segregation		χ^2	*p*
		wt	mutant		
+/*lpa1-7*	F2	159	51	0.057	0.8113

Table 1: Segregation of +/*lpa1-7* phenotypes observed in the F2 progenies obtained by selfing.

	lpa1	*lpa2*	*lpa1-7*
lpa1	-	+	-
lpa2		-	+
lpa1-7			-

Table 2: Complementation test among *lpa1*, *lpa2* and *lpa1-7*

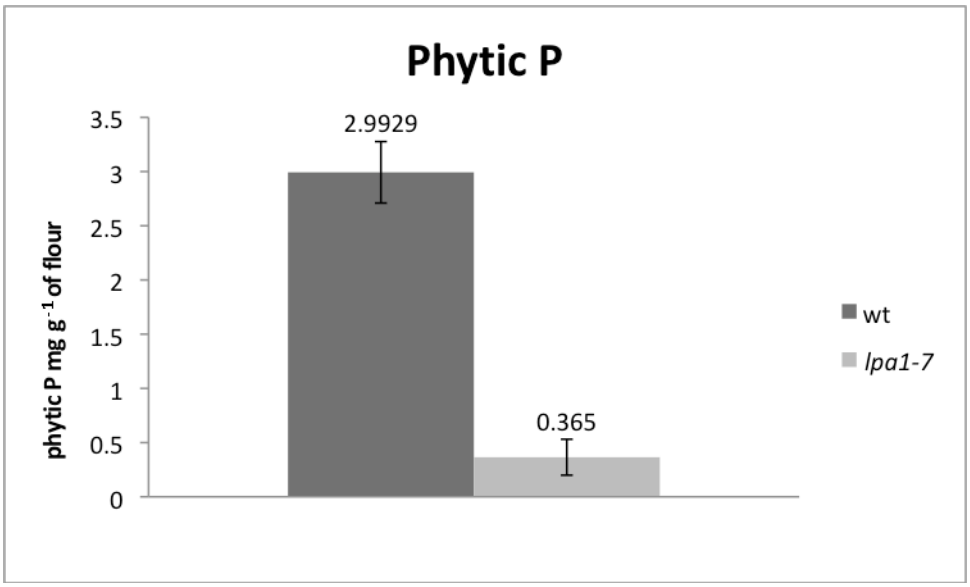

Figure 1: Mature dry seeds of the indicated genotypes were assayed for seed phytic acid P expressed as P concentrations (atomic wt = 31)

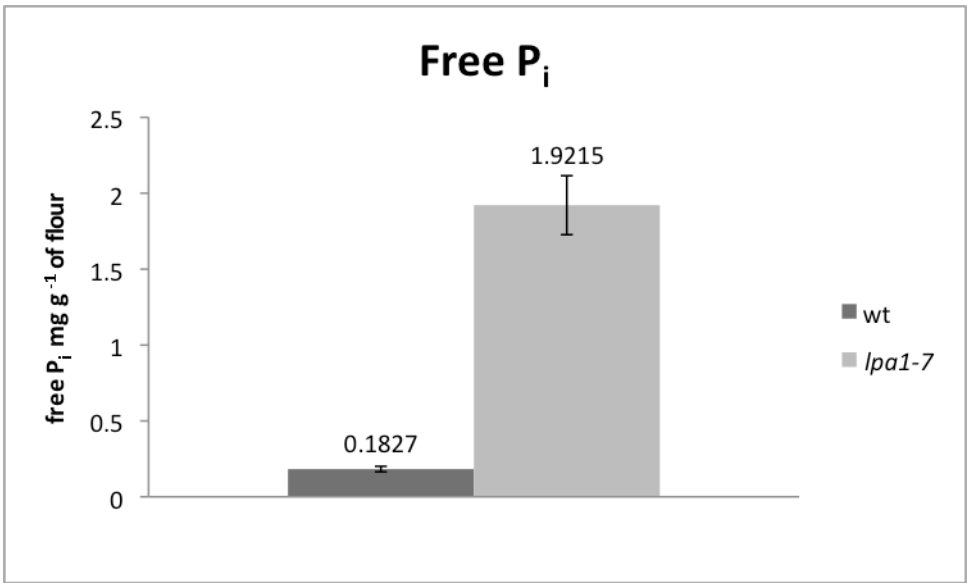

Figure 2: Mature dry seeds of the indicated genotypes were assayed for free inorganic P expressed as P concentrations (atomic wt = 31)