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## 小麦遗传育种专题

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## ➤ 前沿资讯

### 1 . QTL detection for grain size and shape traits using an improved genetic map in einkorn wheat (*Triticum monococcum* L.) (利用改良遗传图谱对小麦籽粒大小和形状性状进行QTL检测)

简介: Einkorn wheat is a diploid ( $A^m A^m$  genome) and is the first cultivated crop that initiated agriculture. It is related to durum and bread wheat, and it harbours unique genes that can be used for wheat improvement. Grain size and shape are the main breeding targets due to their direct relation to yield and milling quality. To understand the genetic control of the grain size and shape-related traits in Einkorn wheat, a biparental population of 150  $F_8$  recombinant inbred lines (RILs) derived from a cross between an advanced einkorn line (ID1623) and a cultivar (MONLIS) was used. The RIL population was genotyped with SNP, Silico-DArT, and SSR markers and a genetic map comprising seven linkage groups (representing  $n=7$ ) was constructed. The map contained 3716 markers distributed across 760 loci with a total length of 1216.09 cM and an average density of one locus every 1.60 cM. Composite Interval Mapping was used to detect the quantitative trait loci (QTLs) controlling seven grain size and shape-related traits using genetic map and the phenotypic data collected from five different environments and the BLUP (Best Linear Unbiased Prediction) values. A total of 33 QTLs (25 novel QTLs) were detected, which were distributed on all the seven einkorn chromosomes. Of these, 14 QTLs distributed on four chromosomes ( $2A^m$ ,  $3A^m$ ,  $5A^m$ , and  $6A^m$ ) were stable across environments. Three QTL hot spots were observed on chromosomes  $2A^m$ ,  $5A^m$  and  $6A^m$ . Seven QTLs, one each for the seven traits with highest PVE% (up to 14-26% PVE in individual environments) were recommended for marker-assisted recurrent selection for improvement of grain traits in einkorn wheat. The study thus provides novel and important genetic information to help understand the genetic control of grain size and shape-related traits and also the genomic resources for use in cultivated einkorn wheat breeding.

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全文链接:

<http://agri.ckcest.cn/file1/M00/03/5C/Csgk0Yj8HgaAOGALABRvfej3fnw695.pdf>

### 2 . Comparison of durum with ancient tetraploid wheats from an agronomical, chemical, nutritional, and genetic standpoints: a review (从农艺、化学、营养和遗传学角度比较硬粒小麦和古代四倍体小麦: 综述)

简介: Under intense breeding, modern wheats, such as durum (*Triticum turgidum* L. ssp. durum), are believed to have lost nutritional quality and protein content while increasing productivity. Emmer (*Triticum turgidum* ssp. dicoccum Thell) and wild emmer (*Triticum turgidum* ssp. dicoccoides) are alternative resources for breeding programs by offering favorable alleles to be introgressed into modern materials and thus broadening their

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genetic diversity. Studies conducted so far have shown that durum wheat has better performance in agronomical qualities and protein quality than *T. dicoccum* and *T. dicoccoides*. However, its grain protein content (GPC) and Fe/Zn concentrations are lower. Several QTL for yield, GPC, and nutrient content in *T. dicoccoides* have been described, demonstrating its potential for transfer of important genes such as *Gpc-B1* into modern cultivars. The *Gpc-B1* gene increased the grain protein and Fe and Zn contents, but the agronomic performance of some of the modern recipients was reduced. Understanding the correlations and relationships between agronomic, chemical, and nutritional qualities would simplify selection through breeding for a single trait. Combining this knowledge with conventional breeding, MAS, and new breeding techniques would facilitate the QTL studies in these ancestral wheats and the development of new durum cultivars while retaining the agronomic qualities. In this review, we compare some grain parameters of *T. durum*, *T. dicoccum*, and *T. dicoccoides* wheats, including Fe and Zn content and their genetic aspects, and the existing information is analyzed and integrated for the future prospects of durum wheat improvement.

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<http://agri.ckcest.cn/file1/M00/10/2E/Csgk0GS1a0SAeYMFAAyjSMDI0xg488.pdf>

## ➤ 学术文献

### **1 . Comparative physiological and proteomic response to phosphate deficiency between two wheat genotypes differing in phosphorus utilization efficiency (磷利用效率不同的两种小麦基因型对磷缺乏的生理和蛋白质组学响应比较)**

简介: Genetic variation in phosphorus utilization efficiency (PUE) widely exists among wheat genotypes. However, the underlying mechanisms are still unclear. Two contrasting wheat genotypes, Heng4399 (H4399) and Tanmai98 (TM98), were screened out from 17 bread wheat genotypes based on shoot soluble phosphate (Pi) concentrations. The TM98 had a significantly higher PUE than the H4399, especially under Pi deficiency. The induction of genes in the PHR1-centered Pi signaling pathway was significantly higher in TM98 than in H4399. Collectively, through a label-free quantitative proteomic analysis, 2110 high-confidence proteins were identified in shoots of the two wheat genotypes. Among them, 244 and 133 proteins were differentially accumulated under Pi deficiency in H4399 and TM98, respectively. The abundance of proteins related to nitrogen and phosphorus metabolic processes, small molecule metabolic process, and carboxylic acid metabolic process was significantly affected by Pi deficiency in the shoots of the two genotypes. The abundance of proteins in energy metabolism, especially photosynthesis, was decreased by Pi deficiency in the shoots of H4399. Inversely, the PUE-efficient genotype TM98 could maintain protein abundance in energy metabolism. Moreover, the proteins involved in pyruvate metabolism, glutathione metabolism, and sulfolipid biosynthesis were significantly

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accumulated in TM98, which probably contributed to its high PUE.

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<https://www.sciencedirect.com/science/article/abs/pii/S1874391923000830?via%3Dihub>

## ➤ 相关专利

### 1. 一种室内春小麦快速繁育简易装置

**简介:** 本实用新型提供了一种室内春小麦快速繁育简易装置, 包括: WAP全光谱LED灯, 位于繁育装置本体上端表面, 所述WAP全光谱LED灯上端连接有连接线; 微电脑时控开关定时器, 位于繁育装置本体侧端, 所述微电脑时控开关定时器通过连接线连接有WAP全光谱LED灯; 育苗盘, 位于繁育装置本体内部, 所述育苗盘放置在繁育装置本体内部底端。本实用新型解决了在实验室进行春小麦快速繁育时, 需要将小麦苗放置在特定温度、光照的温室环境下, 所需成本较高, 容易受实验条件限制, 不便于简易快速繁育, 缺乏春小麦快速繁育的室内简易装置的问题。

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<http://agri.ckcest.cn/file1/M00/03/5C/Csgk0Yj8Gz6AVTwJAATqGFX-SL4508.pdf>

### 2. 一种小麦育种药物浸泡搅拌机构

**简介:** 本实用新型涉及一种小麦育种药物浸泡搅拌机构, 该小麦育种药物浸泡搅拌机构, 一种小麦育种药物浸泡搅拌机构, 包括安装板, 所述安装板的外部设置有搅拌组件; 所述搅拌组件包括固定连接在安装板顶部的第一支撑架和第二支撑架, 所述第一支撑架的左侧固定安装有驱动电机, 所述驱动电机的输出轴固定安装有转动轴, 所述轴承座远离转动轴的一侧与第二支撑架的左侧固定连接, 所述转动轴的外表面固定连接有搅拌叶片、搅拌罐和支撑杆, 所述支撑杆远离转动轴的一端与搅拌罐的左右两侧固定连接。该小麦育种药物浸泡搅拌机构, 驱动电机通过转动轴带动搅拌罐和搅拌叶片旋转, 使搅拌罐内部的小麦不会堆积在一处, 达到了搅拌充分的效果。

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