

## Effects of storage duration and temperature of hydro-primed wheat seeds on seed and seedling quality

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### ABSTRACT

Quality of seed as a propagating organ and the most valuable input to produce crops is highly important in agriculture. Thus, the objective of this study was to compare the effects of storage temperature (15, 20 and 25 °C) and storage duration (0, 2, 4, 6 and 8 days) of hydro-primed wheat seeds of Koohdasht dry land cultivar on germination and seedling characteristics. The seeds were hydro-primed then stored at each related treatment and cultivated in research farm of Lorestan University in October of 2014-2015 growing year based on randomized complete block design with three replications. Results showed that both storage temperature and duration had significant effects on seedling emergence characteristics such as speed and percentage of emergence, lateral root number, leaf number and length, seedling height, tiller number and fresh and dry weights of seedling; however, interaction of storage temperature and duration was only significant for seedling fresh and dry weights. Hydro-primed seeds stored at 15 or 20 °C had better quality in comparison to those stored at 25 °C. Extending the storage period resulted in reduced seedling quality. In overall, seeds stored at 20 °C for 2 days had better germination efficacy than those with other treatments.

**Keywords:** Electrical conductivity, seed storage, seed enhancement, seedling performance.

## بررسی اثرات مدت و دمای نگهداری بذر هیدروپرایم شده گندم بر کیفیت بذر و گیاهچه

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### چکیده

کیفیت بذر به عنوان اندام تکثیر و مهم ترین نهاده برای تولید محصولات زراعی از جایگاه ویژه‌ای در زراعت برخوردار است. بر همین اساس این تحقیق به منظور مقایسه اثر دما (۱۵، ۲۰ و ۲۵ درجه سانتی‌گراد) و مدت زمان نگهداری بذر هیدروپرایم شده (صفر، ۲، ۴، ۶ و ۸ روز) گندم دیم رقم کوهدشت بر خصوصیات جوانه‌زنی و گیاهچه، در آبان ماه سال زراعی ۹۴-۹۳ در مزرعه تحقیقاتی دانشگاه لرستان به صورت آزمایش فاکتوریل در قالب طرح بلوک‌های کامل تصادفی در سه تکرار اجرا شد. نتایج نشان داد که تیمار دما و مدت زمان نگهداری بذر هیدروپرایم شده به طور معنی‌داری بر خصوصیات سبز شدن گیاهچه نظیر درصد و سرعت سبز شدن، تعداد ریشه‌های جانبی، تعداد و طول برگ، ارتفاع گیاهچه، تعداد پنجه و وزن تر و خشک گیاهچه تأثیر داشت. بذور پرایم شده که به ترتیب در دمای ۲۰ و ۱۵ درجه سانتی‌گراد نگهداری شده بودند، نسبت به بذور نگهداری شده در دمای ۲۵ درجه سانتی‌گراد، کیفیت بهتری داشتند. همچنین با افزایش مدت زمان نگهداری بذر، کیفیت گیاهچه کاهش یافت. به‌طور کلی بذوری که در دمای ۲۰ درجه سانتی‌گراد به مدت ۲ شبانه‌روز نگهداری شده بودند، از جوانه‌زنی مطلوب‌تری در مقایسه با سایر تیمارها برخوردار بودند.

**واژه‌های کلیدی:** افزایش کیفیت بذر، انبار کردن بذر، نمود گیاهچه، هدایت الکتریکی.

## Introduction

Wheat (*Triticum aestivum* L.) is the most vital agricultural product in the world. Although wheat consumption rate is different among countries according to their cultural and economic differences, it is one of the major food components in the world (Abotalebian *et al.*, 2005). According to the estimates of the International Food Policy Research Institute, the world's wheat demand (approximately 552 million tons in 2013) will be 40 percent higher in 2020, i.e. more than 770 million tons. However, achievable resources to produce this amount of wheat demand will be much lesser at that time. Thus, it is predicted that wheat production rate will be 100 million tons lesser than the world's need in 2020 and wheat price will achieve much higher rates than the current 150 dollar per ton and purchasing from the world markets will not be possible with the current rates. According to this perspective, developing countries have made efforts to improve wheat yield which is comparable to efforts made in the past three decades and green revolution (FAO, 2013).

Seedling establishment is a critical stage in crop productions. Velocity and uniformity of seedling emergence in direct seeding method may have considerable influence on yield rate and production qualities. In recent years, efforts have been made to improve germination and seedling growth for planting in special environments; one example of these efforts is seed priming technique (Srinivasan *et al.*, 1999).

Priming has positive effects, including acceleration of seedlings emergence, establishment of better and rapid seedlings, more rapid canopy closing, better competitive ability with weeds and better root development that are expected to result in better yield. Priming is more effective under

stressful conditions (Eisvand *et al.*, 2010).

Hydro-priming is one of the conventional priming methods, in which seeds are soaked in pure water for different time durations (Farooq *et al.*, 2006) in order to improve seed germination rate (Tangh *et al.*, 1999; Azarnia & Eisvand 2013).

This technique may lead to better uniformity and rapid germination of seeds, increased seedlings growth, better yield in stressful environments (Basra *et al.*, 2003) and reduction in average germination time and faster seedlings establishment (Nouman *et al.*, 2012).

Wheat hydro-priming and halo-priming lead to increased plumule and radicle length (Abbasdokht, 2011). Seeds priming is an effective and cheap method with low risk, resulting in better establishment of wheat seedling in various environmental conditions (Satar *et al.*, 2010). In one study, wheat hydro-priming resulted in improvement of seedling characteristics and suitable establishment of seedlings (Sadat Alaei Tabatabaei *et al.*, 2013).

In another study, wheat seed hydro-priming resulted in wheat yield components improvement, including grain per spike, number of spikes per area, 1000 seed weight, grain yield, biological yield and harvest index (Puran *et al.*, 2014). Hydro-priming in other crops such as corn may increase germination percentage, germination characteristics and decrease the mean germination time (Ahmmad *et al.*, 2014).

Seed deterioration is highly dependent on temperature and humidity. High temperature during seeds storage is one of the unsuitable factors resulting in increased respiration and rapid consumption of the storage materials, leading to seed deterioration, and affecting germination, emergence and establishment of wheat seedlings in the