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NOTE

SOAKING SUGARBEET SEEDS TO IMPROVE EMERGENCE AT THREE SEEDING DEPTHS AND TWO IRRIGATION TREATMENTS[1]

A.R. Sepaskhah[2]

ABSTRACT

Poor stands of surgarbeet (*Beta vulgaris* L.) are obtained as a result of surface crust formation on the calcareous soils of arid and semi-arid regions. Deep seeding compounds these difficulties. The effect of soaking times of 0, 12, 24 and 48 h on seed germination of a locally recommended cultivar of sugarbeet was studied in the laboratory. The effects of soaking treatments on seedling emergence at depths of 2, 4 and 8 cm and after once and twice watering were also evaluated under greenhouse conditions. Seeds were soaked in running tap water in the laboratory at the temperature of 20-25°C. Air-dried seeds were planted in a Calcixerollic Xerochrept silty clay loam soil. Germination was significantly increased, as compared to the control by 2.8 and 3.8 times for soaking times of 24 and 48 hr, respectively. The seedling emergence after 48 hr soaking at 4-cm depth and twice-watering was comparable to that of 2-cm depth and once-watering treatments. Furthermore, seeds soaked for 48 hr planted at 2-cm depth with once-watering treatment was as effective as the no soaking treatment at the twice-watering treatment in increasing the seedling emergence. Therefore, by soaking the seeds for 48 hr one irrigation could be saved in obtaining the same percentage of seedling emergence. Further research is needed before these results could be applied to the field conditions.

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اثر خیساندن بذردربهبودسبزشدن چغندرقنددرسه عمق کاشت ودوتیمار آبیاری

علیرضا سپاسخواه

استادبخش آبیاری دانشکده کشاورزی دانشگاه شیراز

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1. Contribution from the Department of Irrigation, College of Agriculture, Shiraz University, Shiraz, Iran. Paper No. K-538-63. Received 24 April 1984.

2. Professor, Department of Irrigation, College of Agriculture, Shiraz University, Shiraz, Iran.

خلاصه

در نواحی خشک و نیمه خشک در اثر سله خاک استقرار گیاه چغندرقند بخوبی انجام نمی گیرد. عمق زیاد کشت بذر نیز به نوبه خود بر این مشکل می افزاید. اثر خیساندن بذر بمدت صفر، ۱۲، ۲۴ و ۴۸ ساعت بر روی جوانه زدن یک واریته محلی چغندرقند در آزمایشگاه مورد مطالعه قرار گرفت. همچنین اثر تیمارهای مذکور بر روی سبزشدن و بیرون آمدن از خاک در عمقهای کاشت ۲، ۴ و ۸ سانتیمتری و با یک یا دو بار آبیاری نیز در شرائط گلخانه بررسی شد. بذور در آب لوله کشی روان در دمای ۲۵-۲۰ درجه سانتیگراد خیسانده شده و پس از خشکاندن در دمای معمولی هوا در خاک رسی لومی لای دار کاشته شد. جوانه زدن بذر با خیساندن به مدت ۲۴ و ۴۸ ساعت در مقایسه با شاهد بترتیب ۲/۸ و ۳/۸ برابر افزایش یافت. سبزشدن چغندر با خیساندن بمدت ۴۸ ساعت و عمق کاشت ۴ سانتی متری و دو بار آبیاری با آنچه که در عمق کاشت ۲ سانتی متری و یک بار آبیاری حاصل گردید برابری داشت. همچنین سبزشدن بذر در خیساندن ۴۸ ساعته و عمق کاشت ۲ سانتی متری و یک بار آبیاری تقریبا" با آنچه که در تیمار شاهد و با دو بار آبیاری بدست آمد یکسان بود. بنابراین با خیساندن بذر به مدت ۴۸ ساعت میتوان یک بار آبیاری را برای سبزشدن چغندر صرفه جوئی کرد. تحقیقات بیشتری قبل از کاربرد این نتایج در مزرعه، لازم است.

INTRODUCTION

Any direct-seeded crop faces danger of biotic and abiotic stresses due to a longer time taken for seedling emergence from the soil. This is particularly true for a crop such as sugar-beets (*Beta vulgaris* L.) sown in calcareous soils of arid and smei-arid regions susceptible to surface crust . Furthermore, deep seeding enhances these problems. Under these conditions poor stands reduce crop yield.

Poor germination may be due to the presence of water soluble inhibitors (2, 3), barriers that reduce the penetration of oxygen and water into the embryo (1, 4, 7) or to the presence of toxic levels of inorganic salts (8). Various investigations have been conducted to improve the magnitude and rate of beet germination. Germination could be improved by treatment with chemicals such as dilute acid (1) and cytokinins (1, 13). An effective method of increasing the magnitude and rate of germination of vegetable seeds such as carrots (*Daucus carota* L.) and table beets was reported to be osmo-conditioning, preferably under suboptimal temperatures prior to planting (6, 9, 11).

Deep planting of seeds could have an adverse effect on seedling emergence. Gul and Allan (5) reported a 21% reduction in the emergence rate index of wheat (*Triticum aestivum* L.)

as the seeding depth increased from 8.0 to 10.3 cm. Sepaskhah and Raessi-Ardekani (11) reported that seedling emergence of barley (*Hordeum vulgare* L.) was reduced by 37 and 89% as the seeding depth increased from 2 to 8 and 12 cm, respectively.

The present experiment was conducted to study the interaction effects of soaking times in tap water and seeding depths on the germination and emergence of sugarbeet seeds under laboratory and greenhouse conditions. Furthermore, the influences of once and twice-watering on the seedling emergence were also studied.

MATERIALS AND METHODS

Germination

Soaking treatments were conducted for 0 (control), 12, 24 and 48 hr in the laboratory at 20-25°C. Polygerm seeds of a locally recommended cultivar of sugarbeet in cheese cloth bags were placed in running tap water. The moistened seeds were spread in a thin layer on a paper towel and were dried at room temperature for 24 hr. Treated seeds (30 seeds/dish) were allowed to germinate at 25°C in 9-cm glass petri-dishes lined with two layers of Whatman No. 1 filter paper and soaked with about 10 ml of distilled water. Germination, carried out in darkness, was scored as number of sprouted seeds per 100 seeds as a function of time. The experimental design was completely randomized with three replications.

Emergence

Treated seeds were planted in 4-kg plastic pots, filled with a Calcixerollic Xerochrept silty clay loam soil, under greenhouse conditions. Some physico-chemical properties of the soil were: pH 7.9 (saturated paste), porosity 40.5%, organic matter 1.8%, and saturated extract electrical conductivity (EC_e) 1.1 mmhos cm^{-1}. Air-dried soil was passed through a 2-mm sieve and placed in pots to a bulk density of 1.21±0.01 g cm^{-3}. In order to plant the seeds at 2-,4-and

8-cm depths, the pots were partially filled to depths of 14, 12, and 8 cm, respectively. Forty treated seeds of uniform size were distributed randomly on the surface of the level soil. All of the pots were then filled to a depth of 16 cm. The pots were watered with tap water to a field capacity at the beginning of the experiment, and again after 7 days. The number of emerged seedlings was recorded daily for 15 days. The mean daily maximum and minimum air temperatures were 29.7 and 8.4°C, and the maximum and minimum RH were 90 and 22%, respectively. The experimental design was a 4x3 factorial in a completely randomized arrangement with four replications.

RESULTS AND DISCUSSION

Germination

Seed germination percentages under laboratory conditions as a function of time for the various soaking treatments are shown in Fig. 1. The rate of germination increased as the soaking time increased. Soaking periods of 24 and 48 hr significantly increased the seed germination by 2.8 and 3.8 times compared to the control, suggesting that the seeds may contain inhibitory substances. Similar results were reported by Khan *et al.* (9).

Emergence

Seedling emergence percentages as a function of time for various soaking treatments and seeding depths at the once- and twice-watering treatments are shown in Fig. 2. At 8-cm depth, the emergence rate was negligible and slow at both watering treatments. The rate of emergence at the 4-cm depth was slow at the once-watering treatment and then became greater at the twice-watering treatment. Apparently, at this depth, the rate of emergence was not affected by soaking. At the once-watering treatment, the rate of emergence was higher at the soaking periods of 24 and 48 hr and

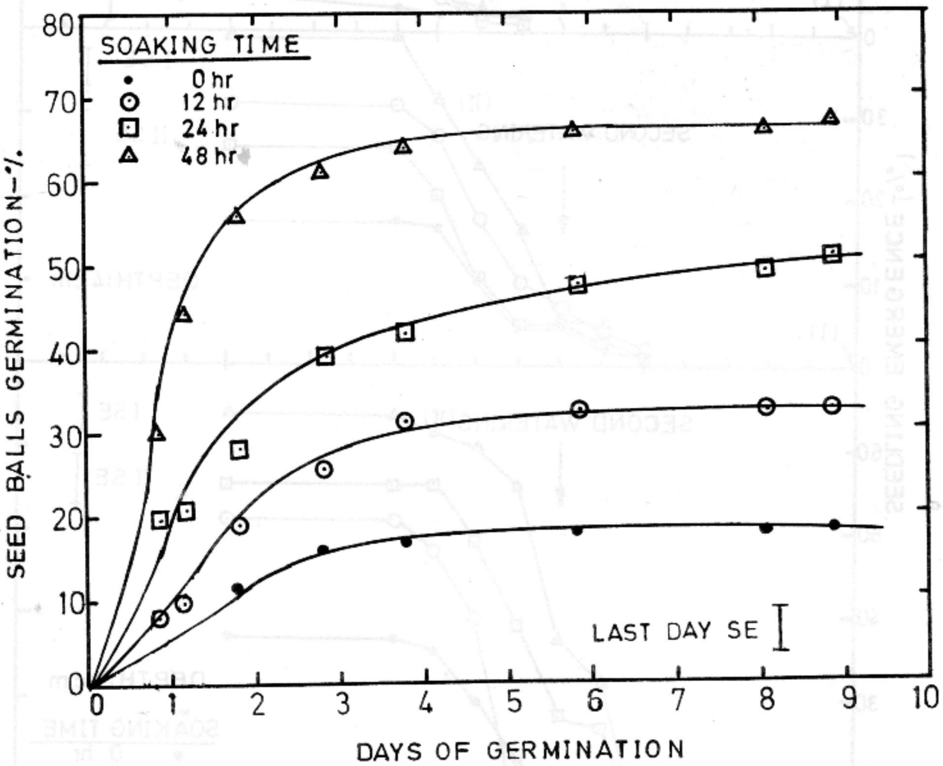

Fig. 1. Germination of sugarbeet seed as a function of time at the various soaking treatments. Bars denotes standard error (SE) to compare the means at the last day germination.

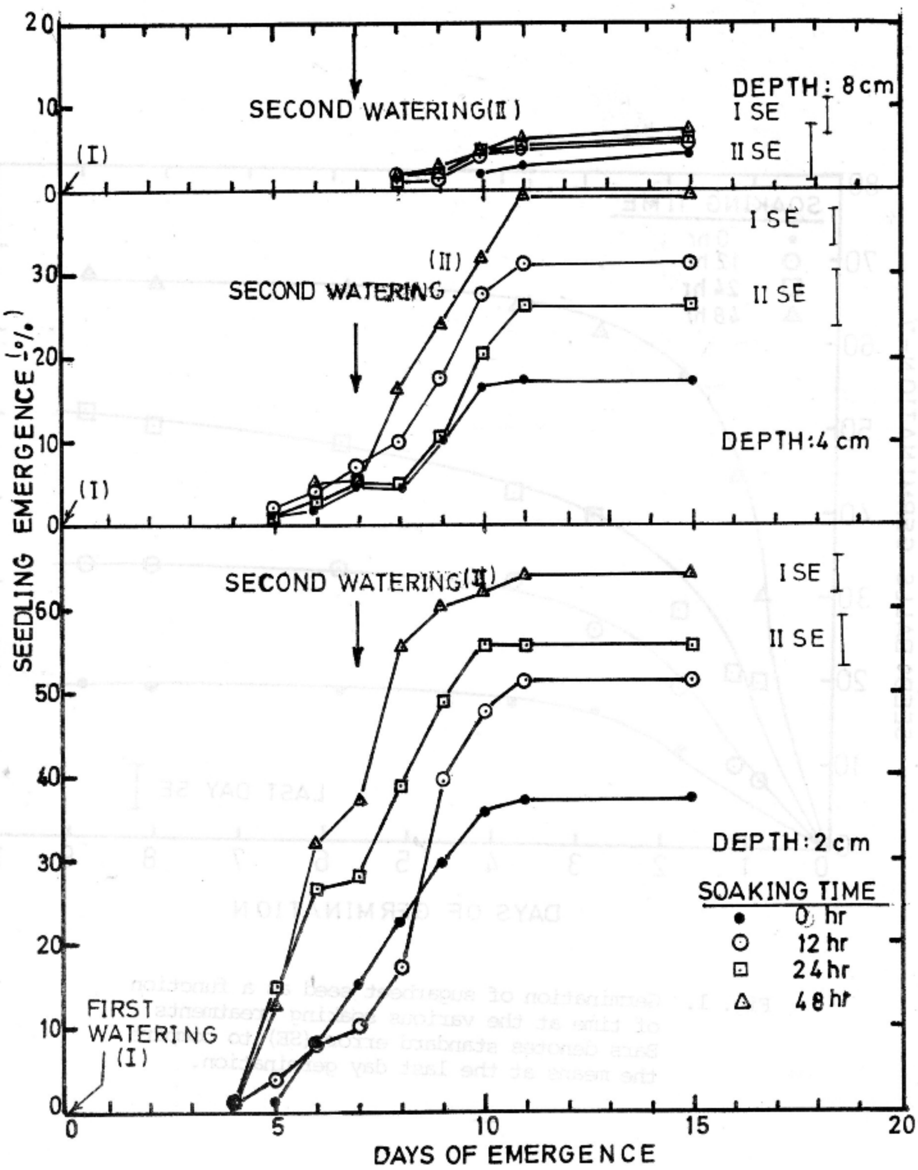

Fig. 2. Emergence of sugarbeet seed as a function of time at the various soaking treatments and seeding depth, at the once and twice-watering treatments. Bars denote standard error (I SE, II SE) to compare the means at the last day of once and twice-watering treatments, respectively.

2-cm depth. However, at the twice-watering treatment and with seeding depth of 2 cm, higher rate of emergence was achieved by all soaking treatments as compared to the control. The interaction between soaking time and seeding depth was significant at once-watering treatment. The seedling emergence at once-watering treatment was increased 3 times by 48 hr of soaking and planting at the depth of 2 cm. Soaking hr treatment did not affect seedling emergence at 4-and 8-cm depths. At the once-watering treatment, seedling emergence was substantially reduced at the seeding depth of 4 cm and drastically reduced at the 8-cm depth.

Soaking for 24 and 48 hr promoted the seedling emegence by 56 and 74% at twice-watering treatment at the seeding depth of 2 cm. There was also a 2.2-fold increase in the seedling emergence at the soaking time of 48 hr and 4-cm depth, but, seedling emergence was not affected at any soaking treatments at the higher seeding depth. Seedling emergence was improved significantly by decreasing the depth of seed placement. The seedling emergence of 48 hr of soaking treatment at 4-cm depth at twice-watering treatment was comparable to that of the seeding depth of 2 cm at once-watering treatment. Furthermore, with the seeding depth of 2 cm, soaking for 48 hr at once-watering treatment was as effective as the no soaking treatment at twice-watering treatment in increasing the seedling emergence. Therefore, by soaking the seeds for 48 hr, once irrigation could be saved in obtaining the same percentage of seedling emergence, or seedling emergence could be doubled with two consecutive irrigations.

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