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Biology of Annual Ground Cherry (Physalis divaricata L.) Weed in lorestan, Iran

Jamshid Nazari Alam[1*],Behrouz Nasiri[1], Hamed Amiri[2], Mitra kosravi[3], Sima Jorabi[3]

1. Lorestan University faculty member and Phd student, Iran
2. Payame-Noor University faculty member of Lorestan
3. Agricultural experts of Lorestan

Corresponding author: Jamshid Nazari Alam

ABSTRACT: Ground cherry (Physalis divaricata L.), a member of the Solanaceae family, is an exotic and important summer season weed of several crops in west of Iran, introduced from India. P. divaricata is a prolific and competitive weed especially in sugar beet, bean crops. This research considers its characteristic in different crop, biology its seed and berry. Result showed that Ground cherry seed became viable between 2 and 3 wk after anthesis and was non dormant when separated from fresh berries. Ground cherry seed was not photoblastic and germinated equally well under both a 14-h photoperiod and continuous darkness. Percentage of unripe seeds germination this weed was 12% before it be cutting but it received to the more than 65% at one week after cutting**.** Ground cherry easily grew up to 71 cm tall, But grew down to 31 and 15 cm tall in alfalfa and wheat, regularity. These weed seedlings begin to germinate from May to September and continued in wheat farm. Ground cherry seeds were able to germination between 5 w after anthesis with 6.7% and Compared with the 10 w after anthesis, which had 99.3% germination.

Keywords**:** Early cutting, Photoblastic reaction, Emergence pattern, Anthesis

INTRODUCTION

Introduction and spread of exotic (introduced, non-native) plants into new regions have become issues of international importance. Exotic plants are often intentionally introduced for food, ornamental, medicinal, and other purposes. Free from the complex array of natural enemies present in their native environments, exotic plants in new lands may experience rapid and unrestricted growth. Once established, exotic plants have the potential to become troublesome weeds and pose long-term problems for agriculture and natural environments (Westbrooks, 1991). Understanding the biology and characteristics of a weed that has recently arrived in the region can be effective in the management. Hence, characteristics such as seed biology, dormancy and ... Can be used to control. Seed dormancy has been described as both ‘‘a seed characteristic, the degree of which defines what conditions should be met to make a seed germinate’’ (Vleeshouwers et al., 1995) and ‘‘an internal condition of the seed that impedes germination under otherwise adequate hydric, thermal, and gaseous conditions’’ (Benech-Arnold et al., 2000). Generally, the requirements for germination of summer annuals decrease during the after ripening phase, causing seeds to germinate under an increasing range of temperatures (Vegis, 1963). If the seeds fail to germinate during the primary dormancy phase, they may enter a phase of secondary dormancy.

Ground cherry is a member of the Solanaceae family and is found in several morphological forms that So far no research has been done on this plant on the being weedy. This weed is reported to be poisonous (Lei, 2007), and it has been grown in crops successfully throughout west of Iran (nazari et al., 2011). Immature berries are green, whereas mature berries are purple, essentially appearing purplish-black. Immature Ground cherry berries are poisonous (DeFelice, 2003; Stephens, 1994). Our interest in Ground cherry began when it appeared as an

important weed in summer crop. The Ground cherry species encompasses a wide range of morphological variability (Love and Dansereau, 1959). Physalis divaricata an annual broad leave infests summer season crops and may greatly aspect their yield and quality. It occurs in several winter and summer crops, but it has become more pernicious in sugar beet due to its similar morphology and growing requirements. There are several components which govern the crop-weed competition. The initial period of several weeks following crop sowing is most critical for crop-weed competition; At present several species of Physalis are recognised in the world of which 1 is native to the Iran, including Ph. divaricata That was reported to be a major weed in India and Pakistan (Lei, 2007). However, indicate Ph. divaricata infested in some parts of India and Pakistan but didn't accomplish work on biology of this weed. To our knowledge, this plant has never been studied.

In this study, we have a different goal. Very little information is available about Ground cherry in the Iran. Knowledge of the requirements for germination, seed survival, impact of early cutting on immature berries, emergence of seedling from berry and will help determine the potential of Ground cherry to become an invasive weed, including predicting the potential distribution range of this species. This knowledge will also assist in developing an optimum Ground cherry management program, if needed. Therefore, the objectives of this research were to determine germination, early cutting and Morphological Characteristics in several crops.

MATERIALS AND METHODS

Effect of early cutting upon Immature seeds viability

To determine the effect of early cutting upon immature seeds viability, ten plants of this weed were randomly selected in flowering and early fruiting stages in sugar beet fields. These selected plants had immature berries. Immature seeds were collected from green berries at 25 d after anthesis, when that these were on plant. Berries with different immaturities were collected from these plants and their seeds extracted from these immature berries. Subsequent, plants were cut and Berries with different immaturities were collected from these plants after one week. Also one week after cutting, seeds extracted from berries. Cumulative seeds of two treatments (before and one week after cutting) were dried at room temperature (c. 22°C) for c. 10 days, then of each treatment counted four batches 100 seeds and so they were placed on filter paper (two sheets of Munktell 1003, 90 mm diameter) and wetted with deionized water (4.0 ml) in a Petri dish (90 mm diameter). Petri dishes were placed in germinator under dark conditions, with a fluctuating temperature regime of 25 ± 2°C for 12 h and 30 ± 2°C for 12 h, Seeds germinated in the two treatments were counted and removed after two weeks.

Photoblastic reaction

Experiments were conducted in 2009 in Lorestan. In September, berries of Ground cherry were collected at maturity from sugar beet fields when the plants of Ground cherry had completely senesced. A 25-seed sample any treatment was placed evenly in a 58-mm-diam Petri dish containing one filter-paper disk moistened with 2-ml of distilled water or test solution. The dishes were sealed with a plastic film3 and incubated in a controlled environmental growth chamber at 28 C with a 14-h photoperiod. To asses photoblastic reaction of ground cherry seeds, fresh seeds were directly obtained by crushing individual berries and thoroughly rinsing the seed with running water and 50 seeds were placed evenly in a 58-mm-diam Petri dish and Petri dishes were either wrapped with aluminum foil to ensure that no light penetrated or left unwrapped to allow light exposure. Germination was tested in growth chambers at 25 and 30 C. A seed was considered germinated when the cotyledons and radicle emerged from the seed coat. Unless noted otherwise, germination tests were terminated at 15 d. Viability of seed was tested using a 1% tetrazolium chloride method (ISTA, 1985).

Emergence pattern in wheat field

The effect of different mounts on seedling emergence of Ground cherry was studied in a wheat field. A wheat field was selected in April and 8 quadrates (1 m2) fixed in it. Number of seedlings was counted as they emerged through the soil. The experiment was terminated to October. Also the number of seedlings emergence at single berry was counted in wheat fields. So that was selected a wheat field and fixed 1 quadrate (1m2) from April to September and counted the number of seedling emergence in single berry of ground cherry weekly.

Germination rate after anthesis

Seeds with different maturities were collected from different plants. Preliminary experiments indicated that berries started developing a purplish-black colour about several d after anthesis. Immature seeds were collected from green berries at 4, 5, 6, 7, 8, 9, and 10 w after anthesis. Each flower on each plant was tagged at anthesis,

and individual berries were harvested at the aforementioned stages to obtain approximately equal numbers of seed for each maturity class. Ground cherry has an extended flowering period and produces hundreds of berries per plant, so it was possible to harvest berries for all seed maturity classes at the same time.

RESULTS AND DISCUSSION

Effect of early cutting upon Immature berries viability

A portion of the ripening Ground cherry fruits began to turn from green to purplish-black by 25 d after anthesis, but most berries needed more than 30 d after anthesis to begin turning purplish-black. The berries that developed later in the growing season took more days to reach maturity than the first few berries that formed on the plant. Berries usually remained on the plant when ripe. Preliminary experiments indicated that berries started developing a purplish-black colour about several d after anthesis. Percentage of unripe seeds germination this weed was 12% before it be cutting but it received to the more than 65% at one week after cutting (fig. 1). Seeds in berries were white blue and soft before cutting whereas they had been brown and rigid at one week after cutting and this showed that seeds changed in inner berries and increased the their viability after cutting. Probably Jelly that surrounded the inner seeds of the berries, caused ripens of those. Also this topic showed that if this weed be cutting in flowering and early fruiting stages by farmer, its seeds can ripen and it causes increase the seed bank so they should carry out of the field. Immature berries are green, whereas mature berries are purple, essentially appearing purplish-black. Immature Ground cherry berries are poisonous (DeFelice, 2003).

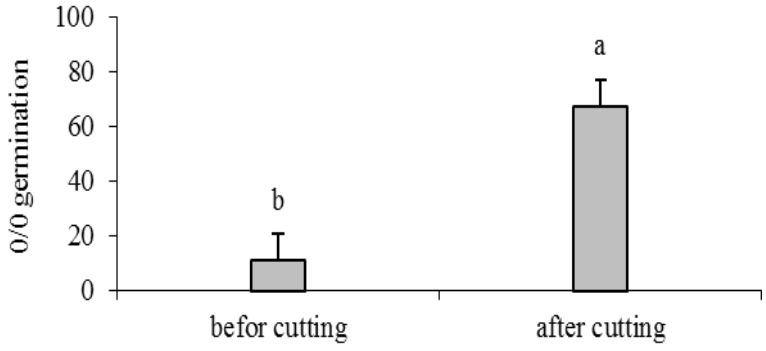

Fig. 1. Effect of early cutting upon viability of seeds the ground cherry.

Photoblastic reaction

Seeds of ground cherry germinated to a high percentage in light and darkness and wasn't significant differences between darkness and light treatments. Seeds of ground cherry didn't need to light for germination (fig. 2). The germination of this specie wasn't increased by exposure to high. Seed germinated at constant temperatures from 14 to 35 C, with optimum germination 25 C (Mousavi and Ahmadi, 2007). Germination rate in dark and light conditions was 97 and 99 percent, regularity. Comparison of means by LSD test showed that there hadn't significant difference with together. Seeds non sensitive to the light in this weed harmful aspect of ecological because their seeds germinated from any depth of soil and they demolish because of lack of nutrients. Light-sensitive seeds for germination in most weeds are found (Ramon, 2002). This study showed that the weed seeds are not light sensitive.

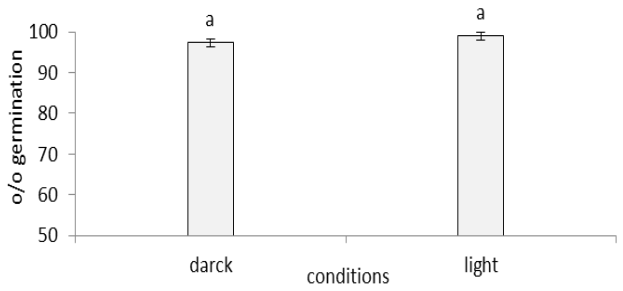

Fig. 2. Comparison of germination the ground cherry in light and dark conditions.

Emergence pattern in wheat field

These weed seedlings begin to germinate from May to September and continued in wheat farm (fig. 3). Emergence seedling of this weed increased with time probably due Temperature. Maximum emergence was applied in September because it can is increase the ambient temperature. After harvest of the wheat in July, fields were irrigated and a large number of seeds appeared (in m^2). Early in October no germination occurred because the weather was cold. Most seeds germinated in the late summer went vanished because faced with the cold weather. Germination from May to September showed that seeds of this weed does not dormancy Because whenever environment conditions is appropriate the weed seeds are capable to germination.

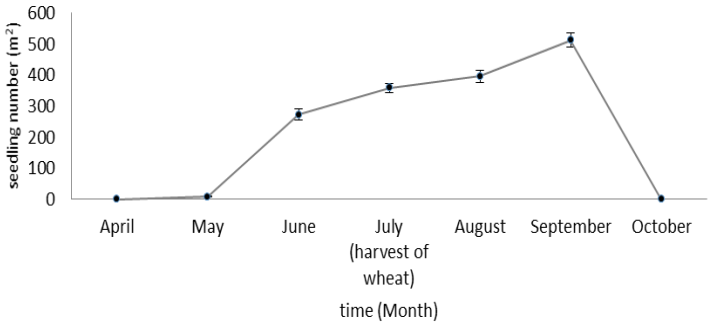

fig. 3. Nomber of emergeced seedlling (m^2) the Ground cherry at wheat fields in different Month

Germination rate after anthesis

Ground cherry seeds were able to germination between 5 w after anthesis, although the germination percentage was only 6.7% at 5 w after anthesis (Tab. 1). In early four weeks since of formation of flower, seeds could not germinate. Compared with the 10 w after anthesis, which had 99.3% germination, freshly harvested seeds (6 w after anthesis) had 26.7% after anthesis. Ground cherry seed was not dormant when initially separated from fresh berries. This response was similar to black nightshade where freshly harvested seed germinated almost 100% (DeFelice, 2003.). In contrast, hairy nightshade seed did not germinate when they were separated from the fresh berries (Bithell et al., 2002; Zhou et al., 2005).

Tab 1. The rate of Germination after anthesis in Ground cherry

Stage of sampling	Germination %
4 weeks after anthesis	0
5 w after anthesis	6.7
6 w after anthesis	26.7
7 w after anthesis	51.3
8 w after anthesis	88.7
9 w after anthesis	98
10 w after anthesis	99.3

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