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SHORT COMMUNICATION

Wild poinsettia (*Euphorbia heterophylla*): an emerging weed in cotton and processing tomato in Greece

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Summary *Euphorbia heterophylla* (wild poinsettia) is reported as an emerging weed in cotton and processing tomato in Kopaida plain, region of Viotia, in central Greece. This is the first record of *E. heterophylla* in tomato crop in Greece. In a field experiment, mature plants grown under weed-free conditions produced on average 19 heads, 64 capsules, and 192 seeds per individual plant. Mature seeds exhibited no dormancy and the maximum germination (82 to 90%) occurred at temperatures from 25 to 35°C, with a drastic decline (<38%) at 15 and 40°C. Light had no significant effect on seed germination in the whole range of temperatures tested. Fully mature plants were taller than cotton, exerting strong competition. Having no light dependence for germination, seeds might have the potential to germinate and emerge from greater soil depths. This short communication summarizes information for the identification, seed germination and growth of this weed species that would support a proper weed management.

Additional keywords: germination, growth, invasive, noxious, weeds

Euphorbia heterophylla (wild poinsettia) is native to Central and South America (Wilson, 1981). Today it is widely distributed throughout the tropics, subtropics and the Mediterranean region. Moreover, it is widely spread as an important weed in at least 28 tropical countries and it is present in another 37 countries (Wilson, 1981). In countries where the species is present, research has been directed mainly towards suitable methods for its control in crops such as peanuts and soybeans (Moore *et al.* 1990; Willard and Griffin, 1993; Brecke and Tobola, 1996). First occurrence of *E. heterophylla* in Greece, was recorded in cotton crop in 2008 (Chachalis and Travlos, 2009). Since then, the species has become a major weed problem in the area Anthochori, Kopaida plain, Viotia, infesting mainly cotton and processing tomato fields. This is the first record of *E. heterophylla* in tomato crop in Greece. This study investigated the seed germination and growth of this species contributing with useful results for the effective management of the weed.

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Morphological Description

Euphorbia heterophylla is a monoecious annual plant, sparsely branched, up to 140 cm tall (Figure 1). Stem is often tinged red towards the apex; leaves are arranged spirally, crowded at stem apex, simple having stipules modified into purplish glands (Mosango, 2008). Inflorescence is a compact axillary or terminal cyme consisting of clusters of flowers (cyanthia), each with basal bracts similar to the leaves, but paler green, with involucres containing one female flower surrounded by many male flowers (Mosango, 2008). Fruit is a deeply 3-lobed capsule; seeds are ovoid, 2.5 mm in diameter, warty, blackish brown, and the embryo is located towards the apex of the seed (Figure 2).

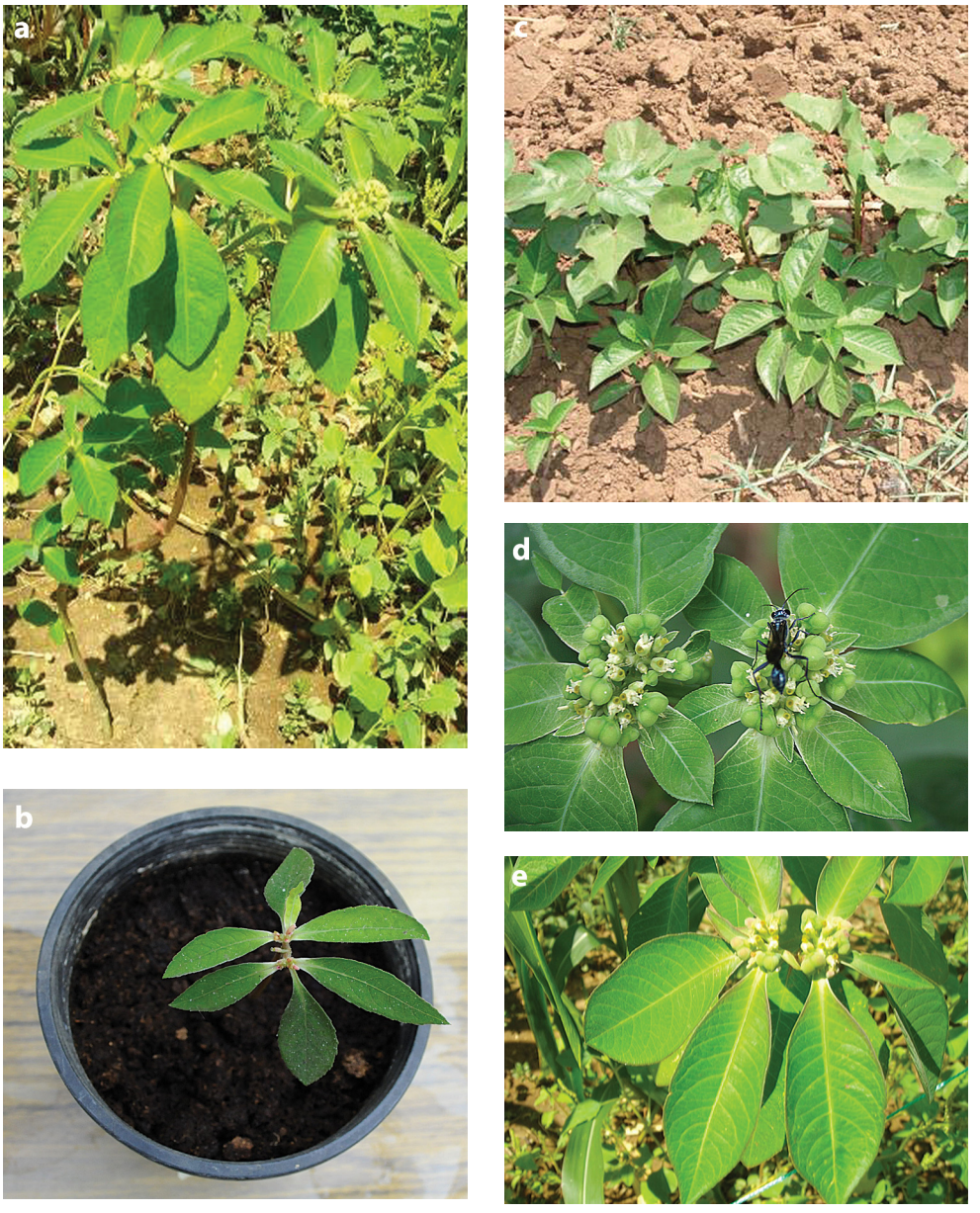

Figure 1. Plant and plant parts of *Euphorbia heterophylla* at different growth stages: a. mature plant; b. young plant; c. newly emerged plants in a cotton field; d. inflorescence; e. leaves

Seed germination and emergence

Seeds of *E. heterophylla* were collected in 2009 from cotton fields at Anthohori, Kopaida region, and stored at approximately 5°C. Mature plants grown under weed-free conditions in field experiments produced on average 19 heads, 64 capsules, and 192 seeds per individual plant. Seed germination was evaluated by evenly placing 25 seeds on a 9 cm-diameter Petri dish containing two layers of filter paper Whatman No. 1, moistened

with 4 ml of distilled water. Petri dishes were sealed with Parafilm. Seed germination was determined in growth chambers under constant temperatures of 10, 15, 20, 25, 30, 35, and 40°C with (95μmol m^{-2} s^{-1}) or without light. Germination percentage was recorded 1 week after incubation (visible radicle protrusion 1 week after incubation). Each mean germination test was replicated four times.

Maximum germination (82 to 90%) occurred at temperatures from 25 to 35°C with a drastic decline (<38%) at 15 and 40°C (Figure 3). These results are in line with previous studies (Bannon *et al*., 1978). Light had no significant effect on seed germination in the whole range of temperatures tested (Figure 3). However, the effect of light on seed germination of this species has been contradictory, with some reports recording no effect on seed germination (Brecke, 1995) as opposed to others showing significant positive effect (Suda and Giorgini, 2000). Apparently, the growth conditions of the mother plants and both the time and the conditions of seed storage prior to germination tests might explain to some extent such discrepancies. In our study, no light dependence for germination indicates that seeds could ger-

Figure 2. Fruit and seeds of *Euphorbia heterophylla*: a. Capsule; b. Seeds; c. Longtudinal section of the seed.

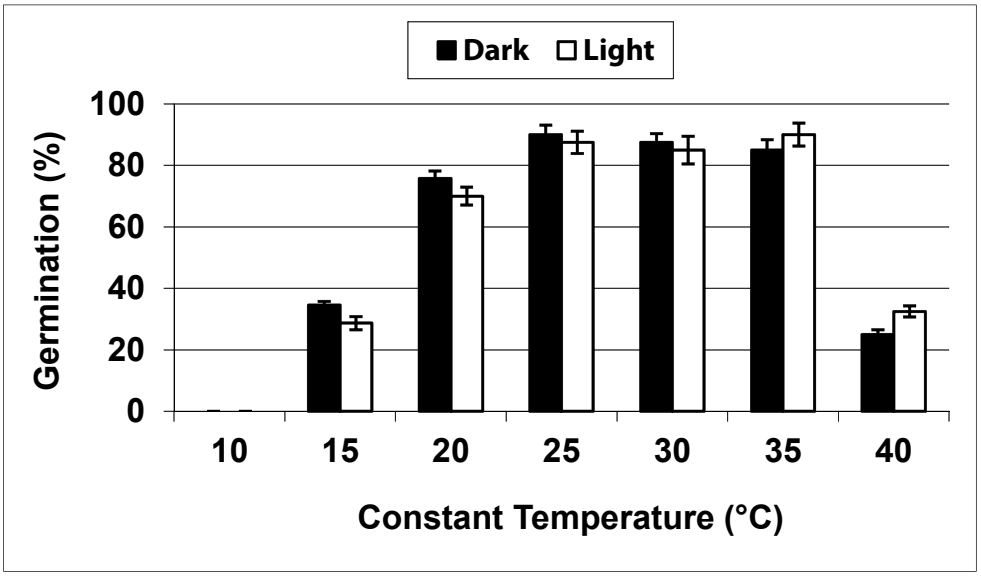

Figure 3. Effect of constant temperature on germination of *Euphorbia heterophylla* seeds incubated in the dark or under a 12-h photoperiod for 1 week. Error bars represent standard error of the means.

minate and emerge from deeper soil, given that light is poorly transmitted to the soil at a depth more than 4 mm (Benvenuti, 1995). The optimum temperatures for *E. heterophylla* seed germination seems to coincide with periods from late spring up to early autumn in the Kopaida region as well as in the whole country and therefore this species could become a significant weed problem for many spring crops in many lowland regions in the country, including major crops such as cotton, processing tomato and maize.

Growth measurements

Cotton (cv. Celia) was seeded on 26 April 2009 in Anthohori region; the seedbed was prepared using a cultivator and later disked for a proper seedbed. Basic pre-plant fertilization (400 kg ha^{-1} of NPK 11-15-15) and urea (N 46-0-0, 80 kg ha^{-1} at 5WAP) was applied, according to standard agronomic practices. Total irrigation was 6,360 mm ha^{-1} based on farmers' empirical estimation. Cotton seeds were sown (25 seeds per meter) and final cotton population was approximately 180,000 plants ha^{-1}. Emergence of *E. heterophylla* was approximately 2 weeks behind that of cotton, however soon afterwards there was a flush of newly emerged seedlings that formed a very dense weed community (Figure 1c). Initial growth rate of the weed was less than that of cotton until the emergence of squares (65 DAP) (Figure 4). At 1st bloom (70 DAP), cotton and weed plants had similar height (~58 cm), whereas after that stage the weed plants were always taller than cotton, reaching a maximum difference at the late ball stage (125 DAP), when weed plants were approximately 40% taller than cotton (Figure 4).

The above data indicate that fully grown weed plants could exert very strong competitive pressure on cotton. In addition, given the lower initial weed growth, it would be important to study competition in cotton cultivation systems with narrow or ultra-narrow rows. In Greece, there has been a renounced interest in such cropping systems mainly due to the significant positive effect on irrigation water and competition on weeds (Darawsheh *et al*., 2009).

Conclusion

In this study, the presence of *E. heterophylla* is recorded in tomato crop for the first time in Greece. In addition, *E. heterophylla* is reported as an emerging weed problem in cotton and processed tomato crops in Kopaida region, Southern Greece. A basic description of *E. heterophylla* along with several images of the species were provided for accurate identification in future recordings in new areas. *Euphorbia heterophylla* was shown to have a relatively short growth cy-

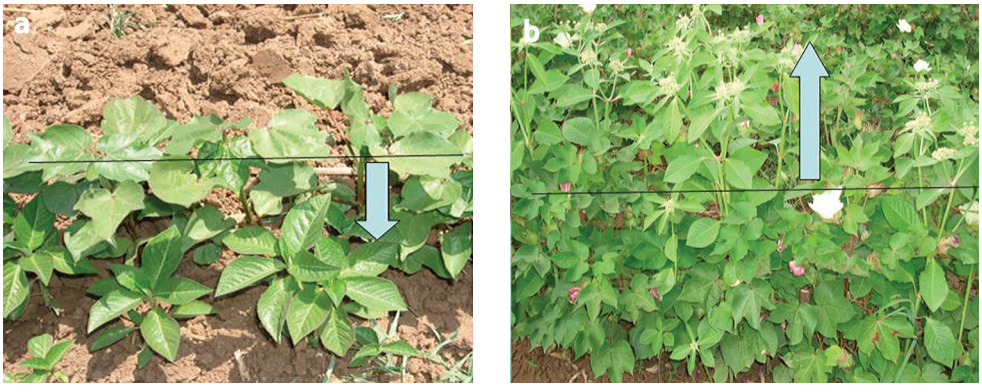

Figure 4. Images illustrating the relative growth of cotton *vs Euphorbia heterophylla* in field: a. At the stage of 4th cotton node; b. At the stage of first balls. Arrows indicate the relative canopy height difference between cotton and weed plants.

cle. Seeds were capable of germination within a wide range of temperatures, without light requirement. Fully mature plants were taller than cotton, exerting strong competition. Special attention should be given to this species to prevent its dispersal to new areas, given its ability to infest many spring crops in the country.

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ΣΥΝΤΟΜΗ ΑΝΑΚΟΙΝΩΣΗ

Η άγρια ποϊνσέτια (*Euphorbia heterophylla*): ένα νέο ζιζάνιο στο βαμβάκι και στη βιομηχανική τομάτα στην Ελλάδα

Δ. Χάχαλης

Περίληψη Η άγρια ποϊνσέτια *(Euphorbia heterophylla*) παρουσιάζεται ως νέο ζιζάνιο στο βαμβάκι και τη βιομηχανική τομάτα στην περιοχή της Κωπαΐδας Βοιωτίας. Αυτή είναι η πρώτη αναφορά του ζιζανίου στην καλλιέργεια της τομάτας στην Ελλάδα. Σε πείραμα αγρού ώριμα φυτά του ζιζανίου, που αναπτύχθηκαν σε συνθήκες έλλειψης ανταγωνισμού, παρήγαγαν κατά μέσο όρο 19 κεφαλές με 64 κάψουλες και 192 σπόρους ανά φυτό. Οι ώριμοι σπόροι δεν εμφάνισαν λήθαργο και η μέγιστη βλαστικότητα (από 82 έως 90%) μετρήθηκε σε θερμοκρασίες από 25-35°C, με μια δραστική πτώση της βλαστικότητας (<38%) σε θερμοκρασίες 15 και 40°C. Το φως δεν είχε σημαντική επίδραση στη βλάστηση των σπόρων σε όλο το θερμοκρασιακό εύρος (από 15 έως 40°C), με αποτέλεσμα οι σπόροι πιθανώς να έχουν τη δυνατότητα να βλαστήσουν και σε μεγαλύτερα βάθη από την επιφάνεια του εδάφους. Τα ώριμα φυτά

του ζιζανίου ήταν υψηλότερα από το βαμβάκι και έτσι ασκούν ισχυρό ανταγωνισμό σε αυτά. Αυτή η σύντομη ανακοίνωση συγκεντρώνει τις σχετικές πληροφορίες για την επιτυχή αναγνώριση του είδους, όπως επίσης και δεδομένα για τη βλάστηση και ανάπτυξή του, στοιχεία απαραίτητα για τη διαχείριση του ζιζανίου.

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