

Investigation of effect of priming with respiratory inhibitors On *Nasturtium officinale*

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Abstract. In order to Effect of priming watercress seeds by respiration inhibitor materials, experimental was carried out in scholar field in 1389. Completely randomized design with four treatments, including no treatment as a control, potassium cyanide, SHAM (both of them is 0.005 mM) and a mixture of these two materials in three replicates as used before treatment and then proceeded to planting on Crete some half a square meter area and in the final root length and plant height and biological yield per plant was measured. Test results indicate that the effect of treatments on root length and shoot and biological function in 1 and 5 percentage levels is significant. Comparing of means that marked the highest average root length obtained by mixing materials related to preventive treatment with a mean 7.91 cm, which is a significant difference with other treatments and the lowest root length associated with treatment of potassium cyanide that average is 6.13 control test was analyzed in a class. The highest shoot length attribute to SHAM treatment was 7.22 but the lowest mean stem length was observed in potassium cyanide. Yield on biological treatment interaction also had the highest value.

Keywords: SHAM, stem length, potassium cyanide, root, watercress

1. Introduction

The metabolic inhibitor cyanide has been reported to be ineffective in blocking seed germination. In fact, Roberts even found CN- salts to break dormancy in several species of cereal grain, and Mayer et al. found CN- to stimulate, mildly, the dark germination of Grand Rapids lettuce seeds. Taylorson and Hendricks concluded that the promotive action of CNon lettuce-seed germination was nutritional, resulting from incorporation of cyanide into amino acids and protein. Yentur and Leopold showed that seed respiration of various species was CN--resistant at early stages of germination but became CN-sensitive at later stages. Lettuce seed germination in the presence of CN- has been found to proceed normally, even if seeds were imbibed directly in solutions containing 10 mm KCN. A common technique utilized in many previous germination studies was to incubate seeds in covered Petri dishes. However, it has been observed during experiments in our laboratory that, if covered Petri dishes containing lettuce seeds imbibed in KCN were sealed with thermoplastic film to prevent desiccation during long incubations, germination was blocked even at very low levels of KCN. Since preliminary observations suggested that inhibited germination was not the result of sealing per se (ie. in the absence of KCN), the apparent cyanide effect was investigated further. The present communication presents evidence that small amounts HCN formed in solutions of CN- salts inhibit germination inclosed systems but are lost as a volatile emanation from opensystems. Most of plant tissues resist on cyanide, so that in the presence of cyanide, respiration rate reaches to 25% and sometimes to 100% than normal respiration rate. Responsible enzyme for oxygen absorption in these cases is known as cyanide-resistant oxidize in respiratory chain of plant mitochondria (Siedow and Berthold, 1986).In this pathway, electrons from main respiratory chain deviate to alternative pathway. Since electrons deviate from ubiquinone (Q) to alternative pathway, therefore, at least two sources of generating energy (2ATP) will not

be considered. If the electrons flow in the alternative pathway, the produced energy assumed for producing ATP, will be wasted as heat. Cyanide-resistant oxidase will be inhibited by special compounds such as SHAM. In some plants, such as *Araceae*, the alternative pathway will be increased before pollination, which this increasing of respiration rate causes the inflorescence temperature increases 14°C than environmental temperature (Raskin et al., 1989). It should be mentioned, that in most plants the cyanide-resistant respiration rate is too low that they do not produce noticeable heat. Lambers (1985) believed that this alternative pathway acts as an overflow and it oxidize respiratory substrates which are more than what is needed for growth. From this perspective, electrons will be entered into the alternative pathway only after saturation of the capacity of the main pathway. Such a thing, in vitro, will occur after the addition of cyanide. Ferguson et al. (1985) considered the effect of low temperature and respiratory inhibitors on calcium flux in mitochondria of avocado fruits. Unlike many studies that show KCN decrease the produced energy and also inhibit Ca⁺⁺ uptake (such as studies about corn, mung bean and potato (Dieter and Marme, 1980; Ralph and Wojik, 1982 and Russell and Wilson, 1978)) in Ferguson's study, KCN clearly stimulate Ca⁺⁺ uptake. Also, comparing to 25°C, 5°C partially increases Ca⁺⁺ uptake. According to different results of using cyanide in plants, this study was done to consider the resistance or sensitivity of *sorghum and wheat* in germination stages .

2. Methods

Research Scholar at the Research Station in the city of Kerman - Iran in 2010 was conducted. Tested on watercress seeds as a randomized complete block with four treatments, including no treatment as a control, potassium cyanide, SHAM (0.005 mM concentration) and mixing these two materials in three replicates used for pre-treatment seeds cultivated in Crete and some half a square meter area was conducted. Traits measured, including length of roots and stems of plants and plant performance were biological. Germination data to ensure the normal, through the SAS Software and mean analysis of variance were by Duncan multiple range test at 5 percent compared were.

3. Results and discussion

3.1. Effect of potassium cyanide and SHAM on root length

Analysis of variance table showed that the effect of inhibiting substances in the breathing level attribute a percentage of root length is significant. After supplied of respiratory inhibitors on the growth of plant roots affects comparing of means that the highest mean root length related to interaction treatment SHAM and potassium cyanide with an average 7.26 centimeters with other treatments in the five percent level is a significant difference. And the lowest root length related to

SHAM treatment mean was 2.33 cm, which with control group had same statistical level. Due to seed treatment with respiratory inhibitors materials available during plant growth and root respiration were affected and the ratio of plant respiration to photosynthesis with respiration have increased and decreased consumption of SHAM Because the normal respiration of plant Imposed than photosynthesis and respiration reduced due to low growth, but at low levels with control treatment had no significant difference test.

3.2. Effect of potassium cyanide and SHAM on stem length

Watercress plant stem length affected the respiratory inhibitor material placed in a percent probability level was significant. Comparing of means of traits of plant height showed the highest stem length related to interactions SHAM and potassium cyanide mean was 5.05 cm, which with potassium cyanide were in same statistical class. Shoot growth could be due to a material impact on the roots and increased root growth and thus it will shoot growth, and the lowest plant height was related to the control group, the treatment SHAM was not significant difference in the level of five percent. Due to process because material impact on its roots and plant height is continuing. However, because the plant was in cold weather conditions and was forced to terminate growth period material could fully put his influence and therefore between experimental treatments such as root (all treatments had a significant different) significant differences were observed.

4.3. Effect of potassium cyanide and SHAM on Plant biomass yield

Biomass Analysis of variance table showed that the effect of respiratory inhibitors materials on the yield per plant biomass in the five percent level is significant. Significant due to this trait can be meaningful to the root and shoot length was attributed, of course, be said, because dry weight was significantly reduced after increased root length and root diameter increased stem diameter, stem length has been reduced. Comparing of means showed the highest dry weight per plant interactions related to treatment SHAM and potassium cyanide with the average 0.019 grams of potassium cyanide and treated with 0.018 g mean was not significant difference in the level of five percent. Combining the two materials used due to increased root growth and plant height, dry weight increase is higher. Lowest dry weight related to the control group with an average 0.008 g; that with SHAM mean 0.012 g was not significant in 5 percent levels. It also reduced due to reduced root growth and shoot is that reducing dry weight per plant compared with other treatments.

Effect of priming with respiratory inhibitors on *Nasturtium officinale*

Treatment	hy root	hy shoot	d w	hr/hs
Control	CB 3.2200	B 1.9433	C 0.008333	A 30.835
Kcn	B 4.2300	A 4.3067	BA 0.018333	B 21.647
SHAM	C 2.3333	B 2.3300	BC 0.012667	A 31.426
Kcn+SHAM	A 7.2867	A 5.0533	A 0.019333	A 33.319

4. Reference

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