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Impact of *Beauveria Bassiana* on the Growth of *Brassica Rapa* under Cobalt Stress

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Abstract

Several endophytic fungi are involved in mitigating the heavy metal stress imposed on plants. The experiment was performed to find the impact of B. bassiana (AL) on the seedlings of B. rapa which were stressed by cobalt Result showed that Cobalt treated plant showed reductions in parameters of growth such as Fresh weight (FW) Dry Weight (DW), Shoot length (SL), germination percentage (GP) and Root length (RL). However, when AL was applied, the seedlings showed a sharp increase in growth parameters. Additionally, the seedlings also produced high relative water content (RWC). It has been concluded that AL improved the Co stressed seedlings through increasing the RWC in it.

Keywords: *B. rapa, B. bassiana, Heavy metal stress and germination percentage*

Introduction

Plant stress responds to external conditions that can negatively affect the development, improvement and function of plants. Stress produces a large range of plant reactions such as altered quality of food, cell digestion, changes in yield of crops and growth rates of plants. Plant stress often indicates certain immediate changes in the environment. However, in soft plant species, exposure to a certain pressure promotes adaptation to that particular pressure in a time-dependent manner **(Nizam *et al*., 2013).** Salinity is one of the major abiotic pressures, which has a profound effect on plant development, especially in arid areas of the world **(Ashrafi *et al*., 2018).**

B. rapa is a two-year-old seasoning spice, developed worldwide, and for the most part is prepared in a quiet environment **(Prota, 2018).** B. rapa has been developed and moreover it has become natural in disturbed habitats in tropical and subtropical climates **(Dock, 2018; Prota, 2018)**. It is considered to occur in vegetation areas, weed fields, roadsides, desert areas near railway tracks, scattered areas, pastures, woodland areas, fields, plantations and river banks. *B. rapa* is recorded as a large group of different phytoplasmas that contribute to important harvests and is conveyed by phloem **(Casati *et al*., 2016).** *B. rapa* is widely described as fruiting between February and October, depending on location and width. The size can be dependent on the wetness and maturity of the soil. High temperatures can cause 'tip to eat' and prevent headaches.

B. rapa is mostly cultivated in temperate areas with moderate yearly temperatures of 5.6-25 °C and an annual rainfall of 350 to 1600 mm **(Wharf, 2018)**. This variety tolerates early frosts, but temperatures below 3.8 °C will kill many cultivars. *B. rapa* is one of the most established Brassicaceae in development **(Prota, 2018).** The results of various cultivars are sold in business units around the world; for example, turnip, Chinese cabbage and pakchoi. Organic products are marketed in commercial sectors in Mexico as bird feed **(Vibrans, 2018)**. B seed oil. rapa is used as cooking oil, modern oil, light oil, for cleaning products and for making biodiesel. B. rapa is usually made with its basic ingredients, leaves, seed oil and grub **(PFAF, 2018)**. Flowers of various kinds are also burned. Taproot (turnip), leaves and flowers are used as a vegetable, blossomed, burnt, cured or eaten raw as a mixed vegetable **(Prota, 2018)**. Plant concentrations are also used as insecticides against lice, red parasites and flies **(PFAF, 2018)**.

Effect of *B. rapa* was thought to be resistant to bleomycin (BLM) which caused aspiratory fibrosis. Liquid concentrate B. rapa (250, 500 mg / kg, po) showed important defensive effect against BLM induced by aspiratory fibrosis in mice by making normal glycoprotein levels (hexose, hexamine and sialic corrosive) and acting on Catalase action (Feline) and Superoxide dismutase (Turf). Concentrate also acts on the content of pneumonic glutathione (GSH) and lowers lipid peroxidation levels in a low-key manner. Histopathological research similarly reveals the variability of lung design to a close proximity to plant extracts. Pre-treatment of mice with B juice. rapa confirmed mice against CCl_4-prompted hepatotoxicity. Treatment significantly reduced serum GOT, GPT, basic phosphatase (mountaineering) and bilirubin levels at 16 ml / kg bw.

The point of this review was to determine the effects of cobalt and AL treatment on seed germination and seedling development of *B. rapa*.

Material and Methods

Prior to conducting experiments, petri plates with filtered paper were disinfected with the help of autoclave for one hour and afterward the seeds of *B. rapa* were surface sanitized, with a (1%) mercuric chloride briefly and afterward washed multiple times with refined water.

For directing an examination, the petri dishes were organized with 10 seeds in each petri dish, treated with 3 mm concentration of Co and AL.

The petri plates were kept at room temperature for seed germination and the reading of germinated seeds were recorded after every 24 hours. After 7 days, the experiment was terminated and Shoot length (SL), root length (RL) were measured while seedlings fresh weight (FW) and dry weight (DW) were taken. vigor index (VI), RWC, root shoot ratio (RSR), stem weight ratio (SWR) and root weight ratio (RWR) were calculated as per given formula:

Germination percentage = (no. of germinated seed / total no. of seed) x 100

Vigor index = (mean of root length + mean of shoot length) x germination percentage
RWC = (fresh weight – dry weight) / fresh weight x 100
RSR = root dry weight / shoot dry weight
SWR = shoot dry weight / total dry weight
RWR = root dry weight / total dry weight

Collected data was determined statistically with the help of SPSS to analyze the variance (ANOVA) and the means compared by Duncan's multiple range test ($P < 0.05$).

Results

Applying AL to germination rate showed decrease against stresses. It was seen that supplement (Co) treated plants showed decrease against stresses in germination rate. Applying AL to shoot length showed decrease against stresses. It was seen that supplement (Co) treated plants showed decrease against stresses in shoot length. Applying AL to Root length showed decrease against stresses. It was seen that supplement (Co) treated plants showed decrease against stresses in root length. Applying AL to New Weight showed better opposition against stresses. It was seen that supplement (Co) treated plants showed decrease against stresses in New weight. Applying AL to Dry Weight showed decrease against stresses. It was seen that supplement (Co) treated plants showed decrease against stresses in dry weight.

Applying AL to relative water content showed reduction against stresses. It was noticed that nutrient (Co) treated plants showed better resistance against stresses in relative water content. Applying AL to Vigor Index showed reduction against stresses. It was noticed that nutrient (Co) treated plants showed better resistance against stresses in vigor index. Applying AL to root shoot ratio showed better resistance against stresses. It was noticed that nutrient (Co) treated plants showed better resistance against stresses in root shoot ratio. Applying AL to stem weight ratio showed better resistance against stresses. It was noticed that nutrient (Co) treated plants showed better resistance against stresses in stem weight ratio. Applying AL to root weight ratio showed better resistance against stresses. It was noticed that nutrient (Co) treated plants showed better resistance against stresses in root weight ratio.

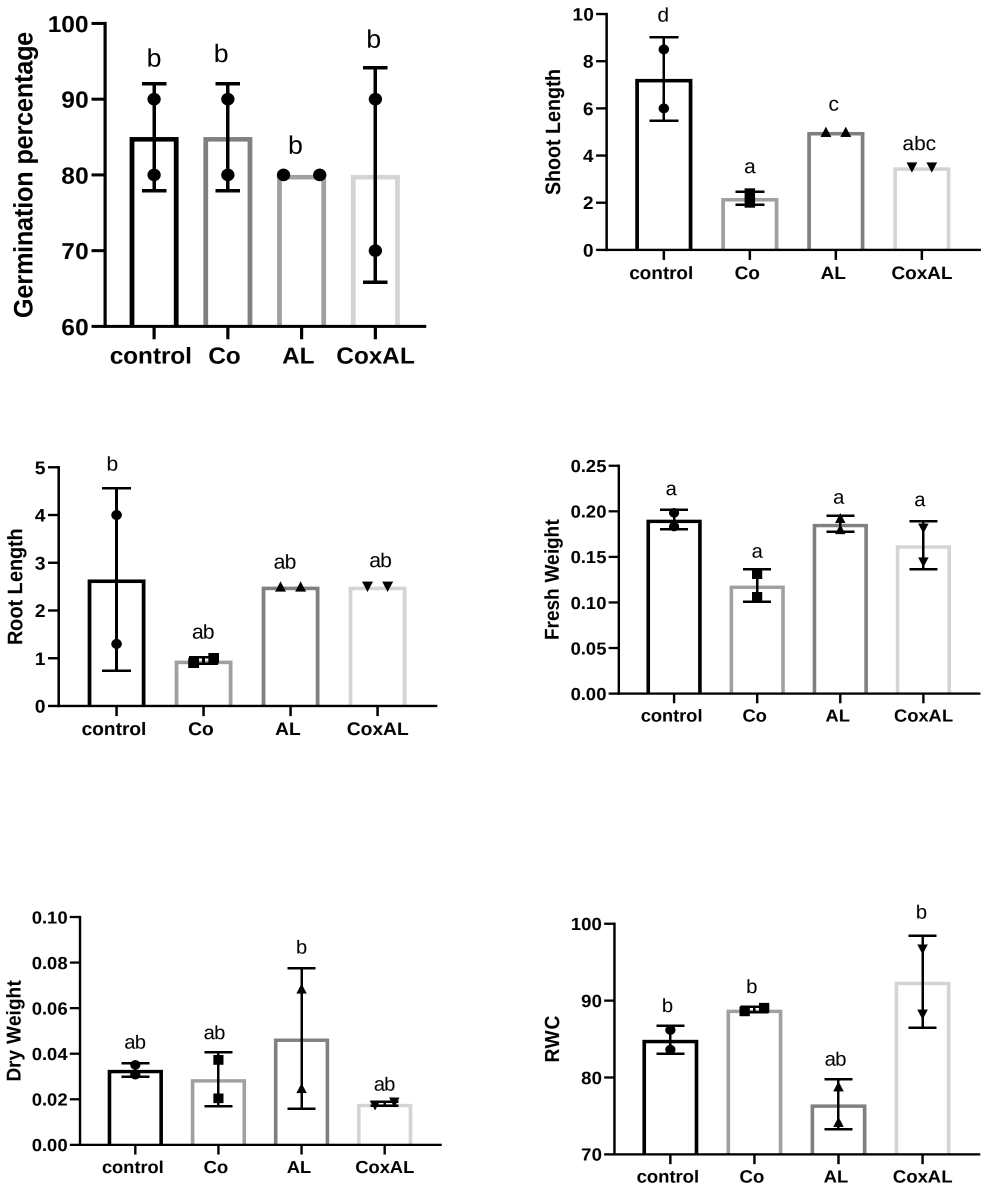

Figure 1. Effect of endophyte (AL) and nutrient (Co) individually as well as in combination with nutrient (CoxAL) on germination percentage (%), shoot length (cm), root length (cm), fresh weight (g), dry weight (g) and relative water content of *brassica rapa*. Different letters on each bar show significance of mean at $P<0.05$

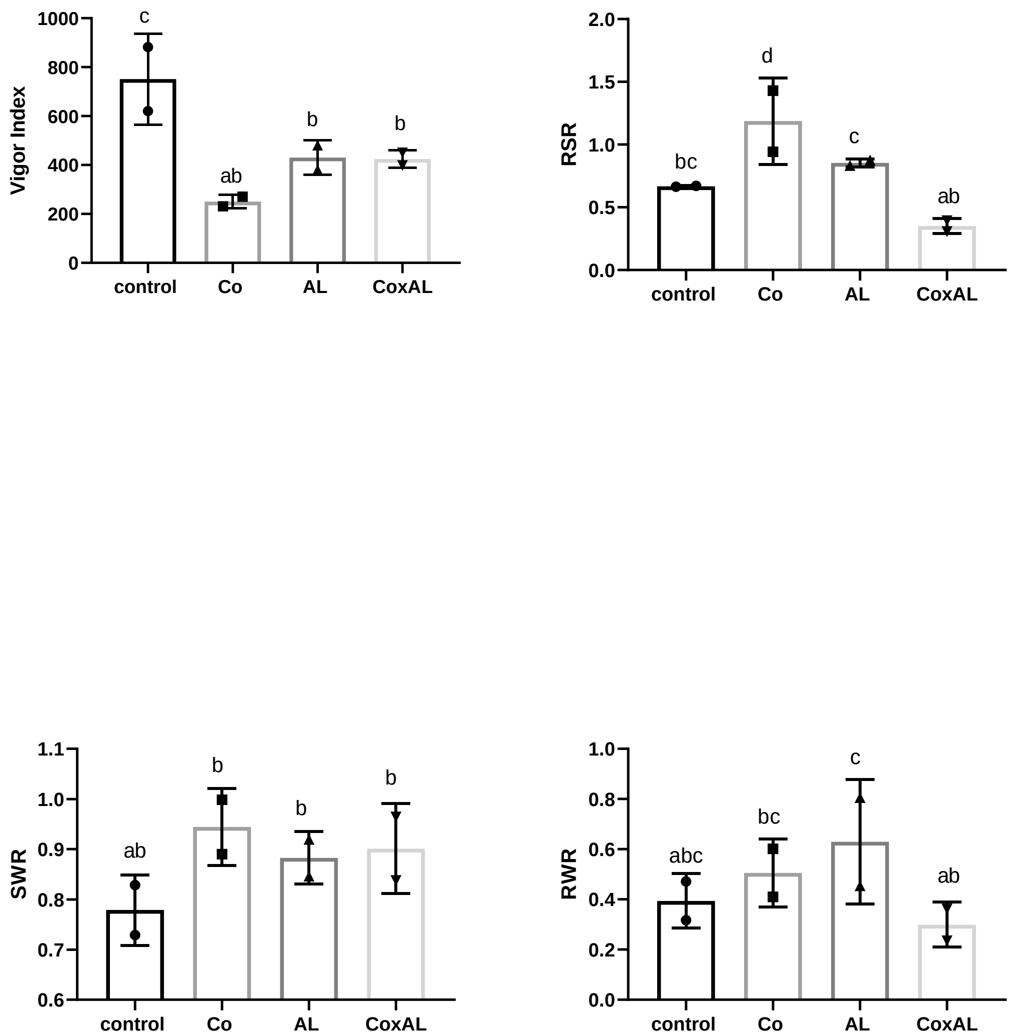

Figure 2. Effect of endophyte (AL) and nutrient (Co) individually as well as in combination with nutrient (CoxAL) on vigor index, root shoot ratio, stem weight ratio and root weight ratio of *brassica rapa*. Different letters on each bar show significance of mean at $P<0.05$

Discussion

Comparative outcomes were likewise detailed by **(Zeid, 2001)** who expressed that the treatment of bean with both minor components either exclusively or as combination didn't repress the extreme distension of bean seeds up to convergence of 10^-1 M. germination level of seeds was decreased by 34,67, and half at 5x10^-2 M of Cr, Co and Cr+Co, separately. The harmfulness of Co was clearer than that of Cr. **(Jayakumar *et al*., 2007)** who expressed that shoot length of R. sativa plants diminished as Co level in the dirt expanded. shoot length was most prominent at 50 mg Co kg-1 soil. A comparable lessening in plant stature was recently announced in nickel treated plants (6,22). Co at undeniable levels might restrain shoot development straight by repressing cell division or cell extension, or a mix of both, bringing about restricted investigation of the dirt volume for take-up and movement of supplements and water, inciting mineral insufficiency. **(Ashraf *et al*., 2012)** who expressed that Co application showed decrease in new weight. **Sharma and Bhandari, (2002)** showed that seed immunization with Brady-rhizobium, yard excrement (FYM) and minerals fundamentally diminished the quantity of knobs, their new weight, leghemoglobin content of knobs and chlorophyll content in cowpea plants. (Ashraf et al., 2012) who expressed that Co application cause decrease in dry weight Prior, **(Castro *et al*., 1997)** revealed that Phaseolus seeds treated with Co showed a critical impact on nodulation, dry weight, physiological quality, energy, protein and supplement content of seeds. **(Al-Rashedy, 2020)** who expressed that flow concentrate likewise shows clear decreases in the general water content in the leaves of mint to 87.878%. because of the presence of 60 mg/kg cobalt, concerning the impact of the component type, we notice that the dirt treatment with the cobalt prompted a critical decrease in the overall water content in the leaves of the mint plant contrasted with the treatment of the dirt with the nickel and it came to (92.36%). The justification for this might be that mineral harmfulness influences plant hydration by hindering water transport. **(Ngo *et al*., 2014)** who expressed that impact of nanocrystalline Fe, Cu and Co on soybean germination and power portrayed that a SDMP portion of 0.08 g ha^{-1} exhibited the best outcome in germination and seedling life contrasted with the higher dosages. Among the three metals examined, nanocrystalline cobalt gave the best seedling life list (SVI) esteem, surpassing 2.4 occasions that of the control test.

(Stray and Ali., 2020) who expressed that cobalt fixations have a critical promotive impact on squash development boundaries, for example, plant tallness, number of leaves per plant, new and dry loads of the two shoots and roots contrasted and control. Cobalt at 10 ppm came about the best qualities. As cobalt rates were gone over 10 ppm, the promotive impact decreased. These outcomes are in congruity with those acquired by **(Stray & Hassan, 2013)** who observed that all cobalt levels fundamentally expanded sweet pepper development and yield boundaries contrasted and control. **(Grummitt, 1976)** who expressed that Co treatment cause better obstruction in stem weight proportion. in the current case comparative species contrasts were noticed. Cobalt-60 focuses were a significant degree lower in com Stover than in potato stems and leaves from a similar plot; take-up by beans was more noteworthy than com by an element of

88 ± 6.6. These distinctions were huge at the 0.1% level. Huge contrasts were clear for the majority of the species in this review recommending that, as on account of stable cobalt, the varieties were presumably hereditarily controlled. **(Stray, 2012)** who expressed that Co application cause increment and delivery the anxieties in root weight proportion. cobalt advances all development boundaries, for example, plant stature, root length, number of branches and leaves particularly with 100% and 75% nitrogen in both 2011 and 2012 seasons.

Information showed that the ordinary portions (100%) of mineral composts gave a promotive impact on dry loads of shoots and roots. As the percent of typical dosages diminished, the dry loads of groundnut shoots and roots diminished. Cobalt improved groundnut biomass with all nitrogen dosages.

Conclusions

The seeds of *B. rapa* was treated with AL and cobalt treatments. AL showed little bit improvement in *B. rapa* growth. The cobalt when applied the growth of *B. rapa* was improved. It has been concluded that cobalt improves *B. rapa* growth as compared to all other treatments.

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