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Enhancement of *Arachis hypogaea* by coelomic fluid from earthworm

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Abstract: Earthworm is considered as farmer's friend and the products from earthworm proved to have more applications. The vermiwash or coelomic fluid unequivocally improved the growth of many plants. The current study is on the effect of seed priming and foliar spray of coelomic fluid collected from *Eudrilus eugeniae*. The growth pattern of *Arachis hypogaea* using different concentrations of coelomic fluid such as diluted (1:10 and 1:1) and undiluted was observed. After 60 days with regular interval of foliar spray, the growth parameters were evaluated. AgRes statistical package was used for evaluating the parameters like root, shoot and seedling length, germination percentage and vigor index. On comparing different concentrations of coelomic fluids, the diluted 1:10 showed a higher significant difference. The study reported that less diluted concentrations enhanced the growth of *Arachis hypogaea* than other concentrations. The coelomic fluid considered to be an organic waste from earthworm and could be the best alternative for chemical fertilizers.

Keywords: Coelomic fluid, *Eudrilus eugeniae, Arachis hypogaea* and plant growth

Introduction:

Plant growth promoters are essential in promoting the growth and development. Most of the promoters are artificial chemicals. The chemical fertilizers and pesticides cause serious environmental hazards that eventually affect the ecosystem, therefore, use of earthworm-derived products are considerably increased as an alternative to chemical fertilizers. Vermicomposting is an eco-friendly approach and in recent years there is an increasing demand for sustainable organic farming systems. The castings from earthworm possess micro and macronutrients essential for plant growth (Nath and Singh 2012) . Auxin like substances also studied in castings (MAHBOUB 2017).

Recently Vermiwash, liquid collected from vermitank was also proved to contain plant growth compounds such as humic acid, Indole-3-butyric acid and cytokinins (Esakkiammal *et. al.*, 2015). The vermiwash

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may contain cytokinins, auxin, amino acid, and vitamins, enzymes possibly derived from microbes associated with earthworms. The coelomic fluid from earthworm also contain plant growth promoting substances and other pharmacological properties (Nadana *et. al.*, 2019)

In the previous study, we reported that cold CF showed an improved plant growth in *Vigna radiata* than other treated fluids. The present work is to study the impact of cold CF with different concentrations on another legume plant, *Arachis hypogaea*. The objectives of the current study is to (i) study the seed priming effect on *Arachis hypogaea* using coelomic fluid with different concentrations (ii) evaluate the plant growth parameters and (iii) compare the effect of different concentrations of coelomic fluid on the growth of *Arachis hypogaea growth*

Materials and Methods:

Crop selection

Certified seeds of *Arachis hypogaea* CO3 were procured from Tamil Nadu Agricultural University, Coimbatore. Seeds were cleaned and surface sterilized with 0.01% mercuric chloride followed by sterile distilled water.

Collection of Coelomic fluid

Culturing of *Eudrilus eugeniae* species and collection method was followed by Nadana *et. al.*, (2019). In the current study, Cold stress was given to collect the coelomic fluid (CF). The diluted (1:1 and 1:10) and undiluted cold CFs was used throughout the experiment.

Plant growth analysis

Seeds of *Arachis hypogaea* CO3 were primed for six hours with three different concentrations of coelomic fluid (undiluted (100worms/100ml), diluted at a rate of 1:1 and 1:10) and control (water).The triplicates were maintained for all the treatments. After six hours of priming, the seeds were transferred to pot and foliar applications of fluids were done once in every five days till 60 days. The morphological growth parameters like shoot length, root length, seedling length, vigour index (G%* Seedling length (cm)) and germination percentage were measured after 60 days of experiment.

Statistical Analysis:

The experimental data of three trials from treatments (T0 – control and T1 to T3 – coelomic fluid treatments with three different undiluted and diluted concentrations (1:1 and 1:10)) were analyzed using Analysis of Variance (ANOVA) method. Completely Randomized Design (CRD) was used for pot study experiments in the AgRes statistical package (Version 7.01) (Nadana et al., 2019). Significant differences among various treatments were analyzed by "F" test in ANOVA. The mean values from all the treatments were compared using least square difference at $P < 0.05$. The Standard Error of Difference (SED) and Critical Difference (CD) (0.05%) were compared among treatments, concentrations and their interactions with plant growth parameters (root, shoot, seedling lengths, vigour index and germination percentage).

Result and Discussion:

Germination percentage of *Arachis hypogaea* CO3 was recorded (Table 1) for coelomic fluid (CF) treatments with various concentrations along with control (water) . Comparatively CF treatment (T1) showed best performance than treatment (T2). The maximum germination percentage (90%) was observed in CF treatment with 1:10 dilution when compared to undiluted and 1:1 dilution. The results of this experiment are in agreement with earlier reports (Suthar 2010).

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The nutrient uptake at low or higher level depends on the factors necessary for the plant (Truong and Wang 2015). The present study also confirmed that seed germination was not affected with respect to different concentrations.

Statistically significant difference was observed in shoot length (Table 1 and Fig 1). The maximum mean shoot length was recorded as 74.33 cm in 1:10 dilution whereas in undiluted and 1:1 dilution was 55.67 and 66.33 cm respectively. The mean shoot length of CF (T1) was also significantly higher than control (T0). The studies from the fluids confirmed the plant growth hormones like auxins and also the compounds having significant impact on the enzymes such as peroxidase and esterase activity involved in the organ development (Nardi et al. 2002). Morphological parameters showed improved growth upon spraying with vermiwash than chemical fertilizer and control lab plants (Rekha et al. 2018). In line with this, our reports also suggest that the shoot length of the plant was increased significantly by coelomic fluids and various treatments had different effects in inducing the shoot length. For instance, the significant shoot length observed as maximum in T1 treatments.

Similar to shoot length, the maximum mean root length observed in CF (T1) treatments with undiluted and diluted with 1:1 and 1:10 dilutions was 24.67, 23.33 and 26 cm respectively. The mean root length of CF (T1) was recorded as 19.67 cm in control (T0). The major significant difference was observed in all the treatments with control. Micronutrients released from vermiwash were documented to contain essential elements to increase the growth of the plant (Hatti et al. 2010). Positively, it was reported that this micro- and macro-nutrients were identified as iron, copper, manganese, zinc improve the plant growth metabolism (Manyuchi *et. al.*, 2013). The results showed that micro and macronutrients might have altered in four different conditions, which were eventually resulted in the growth difference and showed maximum growth promotion.

The mean seedling length of CF with 1:10 dilution was measured as 100.33cm whereas in undiluted and 1:1 dilution was 80.33cm and 89.67cm respectively. Comparatively, mean of CF (T1) was recorded as significantly maximum than control (T0). Overall, the mean seedling length of CF (T1) was 67.21% higher than control (T0). The seedling growth was also found to be maximum when treated with vermiwash (Makkar *et. al.*, 2017). The nutrients from diluted vermiwash favored the vegetative growth, also reported that humic-acid like substances improved the seedlings growth (Ansari 2008).

As maximum seedling length observed in T1 treatments, it was further used to determine the influence of germination percentage by vigour index. The vigour index of *Arachis hypogaea* CO3 was calculated based on germination percentage and seedling length (cm). The significant difference was observed in treatments with different concentrations and their interactions. . The mean vigor index of CF (T1) with 1:10 dilution was 20.89% higher than 1:1 dilution and 40.50% higher than undiluted CF. The overall vigour index mean of CF (T0) was 53.49% lower than 1:10 dilution (T1). The seedling vigour with respect to vermiwash foliar application had a remarkable yield in radish(Thangavel *et. al.*, 2003; Naik *et. al.*, 2014). Seedling vigour for cowpea and paddy crops was maximum when treated with vermiwash (Prabhu 2006).

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Table: 1. Physiological parameters (root length, shoot length and seedling length) on the growth of *Arachis hypogaea* CO3 (AgRes statistical package (Version 7.01))

Treatments	Root length (cm)	Shoot length (cm)	Seedling length (cm)
T0 (Control)	19.67	40.33	60
T1 (1:10)	26	74.33	100.33
T2 (1:1)	23.33	66.33	89.67
T3(undiluted)	24.67	55.67	80.33
Grand mean	23.42	59.167	82.58
SED	0.55	0.78	0.81
CD (0.05%)	1.34**	1.91**	1.99**

Table: 2. Physiological parameters (Germination percentage and vigor index) on the growth of *Arachis hypogaea* (AgRes statistical package (Version 7.01))

Treatments	Germination percentage	Vigor index
T0 (Control)	70	4200
T1 (1:10)	90	9030
T2 (1:1)	83.33	7470
T3(undiluted)	80	6426.67
Grand mean	80.83	6781.67
SED	2.36	203.09
CD (0.05%)	5.77 **	496.97**

Figure 1: Effect of Coelomic fluid treatments on the growth of *Arachis hypogaea* CO3(after 60 days) (T0-Control (water),T1- 1:10 dilutions of coelomic fluid (CF), T2- 1:1 dilutions of coelomic fluid (CF), and T3-undiluted coelomic fluid (CF)).

Conclusion:

The coelomic fluids from earthworm showed the enhancement of *Arachis hypogaea* CO3 with respect to different concentrations. Among all the concentrations of coelomic fluid, T1 treatment with 1:10 dilution showed better outcome in morphological and other growth parameters. The study concluded that fluids with diluted concentrations showed major impact than the undiluted one. The growth enhancement is also due to the presence of other micro and macronutrients present in the fluids. This study results suggest that coelomic fluids could be recommeded as an alternative for chemical fertilizers and also a major source for sustainable organic farming.

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References:

Nath G., Singh K. (2012) Effect of vermiwash of different vermicomposts on the kharif crops. Journal of Central European Agriculture 13, 397–402. https://doi.org/10.5513/JCEA01/13.2.1063.

MAHBOUB KALI (2017) The effect of sawdust vermicompost extract on growth of Dracaena marginata.

Esakkiammal B., Esaivani C., Vasanthi K. (2015) Original Research Article Microbial diversity of Vermicompost and Veriwash prepared from Eudrilus euginae. 4, 873–883.

Nadana G. R. V., Balaji S. K., Palanichelvam K. (2019) Putative volatiles in coelomic fluid of earthworm regulate the growth of Vigna radiata. Biocatalysis and agricultural biotechnology 18, 101070.

Suthar S. (2010) Evidence of plant hormone like substances in vermiwash: An ecologically safe option of synthetic chemicals for sustainable farming. Ecological Engineering 36, 1089–1092.

Truong H. D., Wang C. H. (2015) Studies on the effects of vermicompost on physicochemical properties and growth of two tomato varieties under greenhouse conditions. Communications in Soil Science and Plant Analysis 46, 1494–1506.

Nardi S., Pizzeghello D., Muscolo A., Vianello A. (2002) Physiological effects of humic substances on higher plants. Soil Biology and Biochemistry 34, 1527–1536. https://doi.org/10.1016/S00380717(02)00174-8.

Rekha G. S., Kaleena P. K., Elumalai D. (2018) Effects of vermicompost and plant growth enhancers on the exo-morphological features of Capsicum annum (Linn.) Hepper. International Journal of Recycling of Organic Waste in Agriculture 7, 83–88. https://doi.org/10.1007/s40093-017-0191-5

Hatti S. S., Londonkar R. L., Patil S. B. (2010) Effect of Eisenia fetida vermiwash on the growth of plants. Methods 1, 6–10. https://doi.org/10.1046/j.15298817.2002.01160.x.

Manyuchi M. M., Phiri A., Muredzi P. (2013) Effect of Vermicompost , Vermiwash and Application Time on Soil Micronutrients Composition. 215–218.

Makkar C., Singh J., Parkash C. (2017) Vermicompost and vermiwash as supplement to improve seedling, plant growth and yield in Linum usitassimum L. for organic agriculture. International Journal of Recycling of Organic Waste in Agriculture 6:203–218. https://doi.org/10.1007/s40093-017-0168-4.

Ansari A. A. (2008) Effect of Vermicompost and Vermiwash on the Productivity of Spinach (*Spinacia oleracea*), Onion (*Allium cepa*) and Potato (*Solanum tuberosum*). World Journal of Agricultural Sciences 4, 554–557.

Thangavel P., Balagurunathan R., Divakaran J., Prabakaran J. (2003) Effect of vermiwash and vermicast extract on soil nutrient status, growth and yield of paddy. Advances in Plant Sciences 16, 187–190.

Naik V. R., Patel P. B., Patel B. K. (2014) Study on effect of different organics on yield and quality of organically grown onion. The Bioscan 9, 1499–1503.

Prabhu M. J. (2006) Coconut leaf vermiwash stimulates crop yield. The Hindu Newspaper, 28th December. Science and Technology section 15–16.