Original Research Paper

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SEASONAL VARIATION OF PROTEIN, LIPID PEROXIDATION, REDUCED GLUTATHIONE, ASCORBIC ACID, LIPID, SUPEROXIDE DISMUTASE AND CATALASE LEVEL OF *EUDRILUS EUGENIAE*

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ABSTRACT Earthworms *(Eudriluseugeniae)* were taken in different season from the vermiculture bed and processed for the biochemical analysis. The lipid peroxidation (LPX), ascorbic acid (ASA), lipid, reduced glutathione (GSH) superoxide dismutase (SOD), catalase activity (CAT) and protein content were measured and compared.Protein content (mg/g tissue) gradually decreased in winter, rainy and summer respectively ofit at different season. Protein content was highest in winter.GSH content (mg/g tissue) gradually decreased in winter, rainy and summer respectively. GSH content was highest in winter.LPX content (mg/g tissue) gradually decreased in winter, rainy and summer respectively. LPX content was highest in winter.Lipid content (mg/g tissue) gradually decreased in winter, rainy and summer. Lipid content was highest in winter.ASA content (mg/g tissue) gradually increased in winter, rainy and summer respectively of *Eudriluseugeniae* at different season. ASA content was highest in winter.SOD content (mg/g tissue) gradually increased in winter and rainy and then decreased in summer of *Eudriluseugeniae* at different season. SOD content was highest in rainy.CAT content (mg/g tissue) gradually increased in winter, rainy and then in summer respectively of *Eudriluseugeniae* at different season. CAT content was highest in summer.

KEYWORDS : season, Earthworm, Eudrilus eugeniae

INTRODUCTION

The earthworm *Eudriluseugeniae*, a native African species and an ideal candidate for vermicomposting of organics, is now widely distributed in different agricultural fields of India (Mubeen and Hatti 2018; Samal *et al.,* 2019a). Samal *et al.,* (2019a) reported that the herbicide glyphosate affects morpho-histology and enzyme activities in *E. eugeniae* at the Indian-recommended dose after 24-h exposure. Elevated concentrations of agrochemicals at different exposure times result in a number of effects on the earthworms (Shi *et al.,* 2017; Singh *et al.,* 2019; Gowri and Thangaraj 2020). Climate change effects on soil food webs can be caused by altering the activity and mortality of soil organisms. Increasing temperature (enhancing metabolic demands), frequency of extreme precipitation events and droughts may additionally cause mortality by changing the life cycle and nutrition of soil animals (Thakur *et al.,* 2018). A recent global analysis highlights the importance of climate changes like increasing air temperature and altered mean annual precipitation on earthworm diversity (Phillips *et al.,* 2019). However, in order to develop and improve models of the effects of climate change on soil fauna distributions and predict potential impacts on ecosystem processes, more ecological research into the climatic tolerances of these important soil invertebrates is required (Eisenhauer *et al.,* 2017). Despite the widely acknowledged important role of earthworms for ecosystems and the obvious threats from climate change phenomena (Siebert *et al.*, 2019b), there is still no comprehensive overview of the effects of climate change on earthworm communities. Temperature is one of the principal environmental agents determining activity of biota and rates of decomposition processes in the soil (Swift *et al.,* 1979). Temperature effects on a number of soil functions have been investigated, including activities of soil invertebrates (Byzova, 2007). In the present work the variation of different antioxidant parameter of *Eudriluseugeniae* in different season were studied.

MATERIAL AND METHODS

Collection and preparation of the sample

The earthworm,*Eudriluseugeniae*were purchased from soil conservation office, Markona, Balasore and were acclimatized for seven days in the laboratory condition prior to the experiment. The earthworm, were cultured in the laboratory around the year and earthworms are collected randomly from different season(summer, rainy and winter)prior for the comparison between the content of the biochemical parameter in different season. Thus 5-6 in number were picked up from each tray and their whole-body weight was measured. A 10% homogenate was prepared with phosphate buffer (pH 7.4) The supernatant was taken for biochemical assay.

Methods

Estimation of different biochemical parameter in different season were done by several methods such as Protein by Lowry *et al.,* (1951),reduced glutathione (GSH) by Ellman (1959), Lipid peroxidation assay by Ohkawa*et al.*, (1979), superoxide dismutase (SOD) activity by Das *et al.,* (2000), catalase (CAT) by Beers and Sizer (1952), Lipid content by Folch method and Ascorbic acid content by Jagota and Dani(1982) method.

RESULT AND DISCUSSION

Protein content was highest in winter (Fig.1)andOne way ANOVA reveals that the protein content in different season in*Eudriluseugeniae* is significant (F (2, 29) =17.886, P=0.000). It is revealed from the Post Hoc analysis that the protein content was significant ($P<0.05$; LSD) at 0.05 level of significance. GSH content was highest in winter (Fig.2). One way ANOVA reveals that the GSH content at different time intervals in*Eudriluseugeniae* is significant (F (2, 29) =4.193, P=0.026). LPX content was highest in winter (Fig.3). One way ANOVA reveals that the LPX content in different season in*Eudriluseugeniae* is significant (F (2, 29) =0.579, P=0.567). Lipid content (mg/g tissue) gradually decreased in winter, rainy and summer respectively. Lipid content was highest in winter (Fig.4). One way ANOVA reveals that the Lipid content was significant (F (2, 29) =11.373, P=0.000). It is revealed from the Post Hoc analysis that the Lipid content was significant ($P<0.05$; LSD) at 0.05 level of significance. ASA content (mg/ml protein) gradually increased in winter, rainy and summer respectively. ASA content was highest in winter (Fig.5). One way ANOVA reveals that it wasis significant (F (2, 24) =61.337, P=0.000). It is revealed from the Post Hoc analysis that the ASA content in different season in*Eudriluseugeniae* was significant ($P<0.05$; LSD) at 0.05 level of significance. SOD content (unit/mg protein) gradually increased in winter and rainy and then decreased in summer. SOD content was highest in rainy (Fig.6). One way ANOVA reveals that the SOD content indifferent season in*Eudriluseugeniae* is significant (F (2, 14) =46.699, P=0.000). It is revealed from the Post Hoc analysis that the SOD content in different season in*Eudriluseugeniae* was significant ($P<0.05$; LSD) at 0.05 level of significance. CAT content (η kat /mole tissue) gradually increased in winter, rainy and then in summer respectively. CAT content was highest in summer (Fig. 7). One way ANOVA reveals that the CAT content indifferent season in*Eudriluseugeniae* is significant (F (2, 24) =10.184, P=0.003). It is revealed from the Post Hoc analysis that the CAT content in different season inthisearthworm is significant ($P<0.05$; LSD) at 0.05 level of significance.

DISCUSSION

Tiwari and Joshi (2022) concluded that the earthworm population increases during monsoon season and clitellates were more abundant than aclitellates in all land uses.Bagari *et al.,* (2019) concluded that seasonal environmental factors prevailing during different seasons were much influenced on various life activities (such as incubation period, percent hatching, number of hatchlings, biomass, growth rate, time taken for sexual maturity, mating period and cocoon production) of the earthworm, *Eudriluseugeniae.*Maximum values were observed during the raining season by Lavelle (1978). But here in the present work it is observed that season had a great impact on antioxidant systemand enzymatic activity of the earthworm also affected by the season.

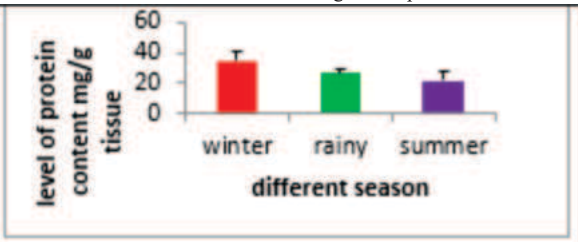

Fig-1-Comparison of protein content (mg/g tissue) ofEudriluseugeniae at different season

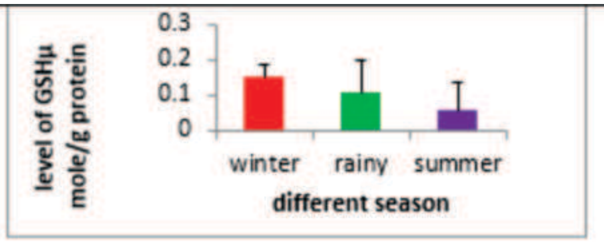

Fig-2-Comparison of GSH content (mg/g tissue) ofEudriluseugeniae at different season

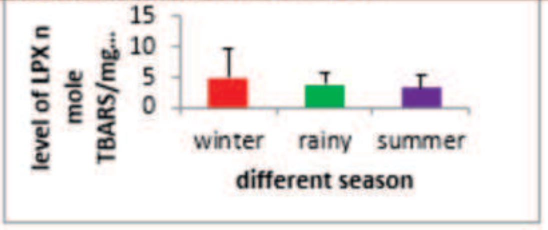

Fig-3-Comparison of lpx content (mg/g tissue) ofEudriluseugeniae at different season

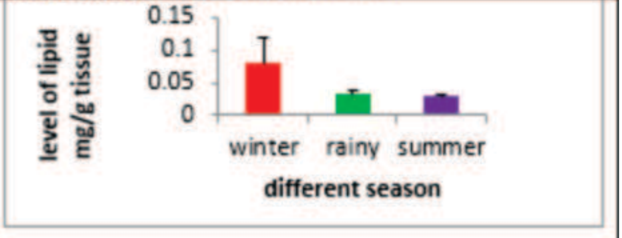

Fig-4-Comparison of lipid content (mg/g tissue) ofEudriluseugeniae at different season

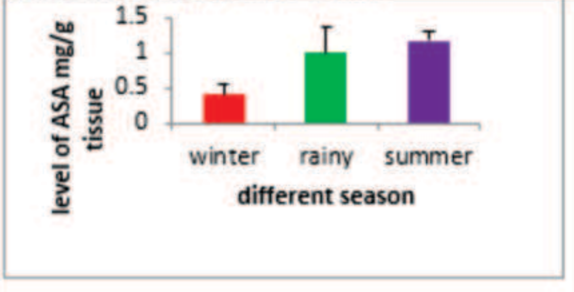

Fig-5-Comparison of ASA content (mg/g tissue) ofEudriluseugeniae at different season

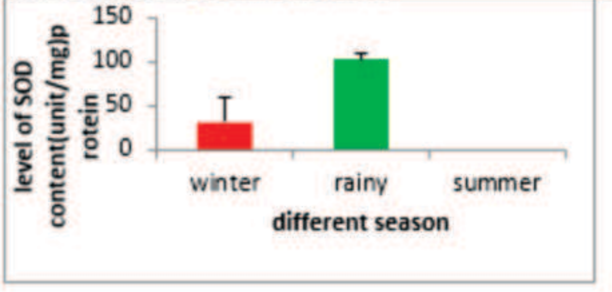

Fig-6-Comparison of SOD content (mg/g tissue) ofEudriluseugeniae at different season

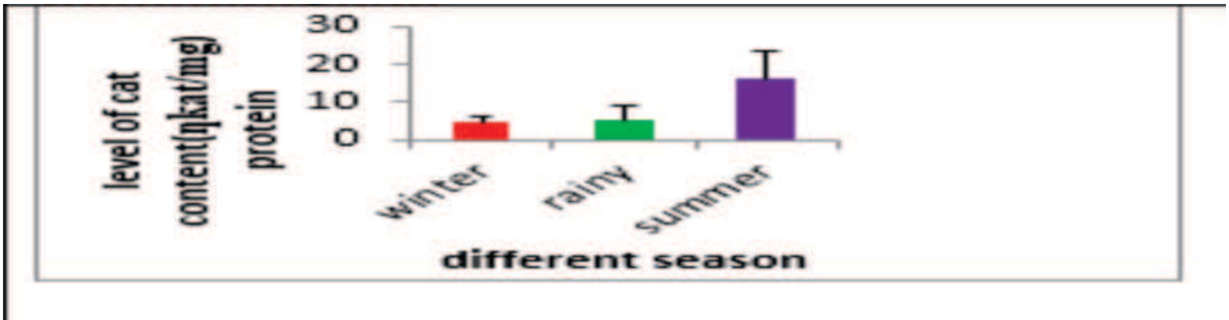

Fig-7-Comparison of cat content (mg/g tissue) ofEudriluseugeniae at different season

CONCLUSION

It was concluded that the antioxidant system of *E. euginae* is well developed to defend against the stress or reactive oxygen species produced due to exposure to various stress, it may be the variation of temperature in different climatic condition. When the different biochemical parameters were taken in consideration, it was concluded that the winter is the best weather or favourable season whenmany of the antioxidant parameter are in their peak position. Thus, the winter is the best season for their reproduction also. Particularly, the protein,LPX,GSH,lipid,ASA, SOD and CAT were very effective in comparison to other biochemical parameters.

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