EFFECT OF WEED EXTRACT ON CARBOHYDRATE METABOLISM OF PEARL MILLET (*PENNISETUM GLAUCUM* L.R.BR.,)

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ABSTRACT

Aqueous extract of Bryophyllum, Calotropis, Kalanchoe andTephrosia screened for their growth promoting role harp on converting the otherwise troublesome weeds into an effective green manure. The present study is an attempt to develop a simple and low cost strategy to enrich the seedling growth and boost up production of pearl millet with leaf extracts. Seedlings from seeds treated with extracts were analyzed for parameters such as carbohydrate content, reducing sugars, starch accumulation, amylase activity, nitrogen and chlorophyll estimation. Green manuring with low concentration of leaf extracts from common weeds thus proves beneficial to the growth of pearl millet.

Keywords: Aqueous extract, Green manure, seedlings

INTRODUCTION

Today, the world wide yield loss of major crops is estimated to be around 51.8%, of which 11.2% is by pests, 16.6 % diseases and a major share of 24% is due to weeds (Oerke and Steiner, 1996). Weed infestation is certainly a major problem in field conditions. Weed species compete with crops for nutrients, light and soil moisture. They may have harmful effects on crops because of the chemical substances they release from their leaves and roots into the environment. These substances may have deleterious impact on other plant species while in some cases the effect is beneficial.

Weeds are the plants that grow where they are not wanted. They grow in the crop fields faster and thus reduce crop yields (Tata, 1980). Agro-chemicals used for controlling pest and weeds leave behind negative impact on environment that is too serious to be ignored. In the context of

vexing weed problems and growing impetus on organic farming the preposition of effectively converting the constituent weeds of agroecosystem as a biomanure receives special emphasis. It is suggested that an optimum combination of organic sources can meet the requirement of stepping up higher yield without sacrificing the quality of crop. It is reported that bio-contents present in the leaf powders can synergistically interact with aminoacids, especially tryptophan (the precursor of Indole Acetic Acid) in favoring germination, seedling establishment and enhancement in vegetative growth and yield (Krishnasamy, 2004)

This study is primarily undertaken to evaluate the potential of few weeds as biomanure. With an intent of ascertaining the impact of the decomposing bio-content of weeds and to assign positive role, if there be any, this study is focused to evaluate the effects of leaf extracts of *Bryophyllumpinnatum, Calotropisgigantea, Kalanchoepinnata* and*Tephrosiapurpurea* on the germination, vegetative growth and flowering of pearl millet (*Pennisetumglaucum* L.R.Br.,)

Pearl millet (*Pennisetumglaucum*L.R.Br.,) is one of the most drought tolerant cereal crops grown in arid and semiarid regions of the world. It is the important source of diet for the major portion of Indian and African people. It can produce some grains even under most adverse farming condition and therefore it is preferred by farmers as a low cost risk option not only by choice but also by necessity. For increasing the productivity of pearl millet hybrids, it is essential to grow them with high yield.

MATERIALS AND METHODS

COLLECTION OF PLANT MATERIALS FOR EXTRACTION

Plant materials such as *Bryophyllumpinnatum, Calotropisgigantea,Kalanchoepinnata* and *Tephrosiapurpurea* leaves were collected from Thiagarajar College Campus, Madurai. Mature fresh leaves without any disease are collected for extraction.

PREPARATION OF THE EXTRACT

Ten gram leaves of *B. pinnatum C. gigantea, K .pinnata* and *T .purpurea* was washed with tap water and then the leaves were ground with pestle and mortar. 20ml of distilled water is added and made into slurry. After 24 hours chilling, the slurry was filtered through whatman filter paper I. 2ml of extract were taken from the filtrate and the final volume was made up to 100ml.

BAJRA – THE TEST PLANT

Bajra, popularly known as pearl millet, variety ICMV 221, were collected from Farm aid Service, Madurai. Seeds were graded and uniform size of seeds was used for experiments in pot cultures.1 g of seed lot contained 82 seeds.

BIO- CHEMICAL PARAMETERS UNDER CONSIDERATION

Bio chemical parameters such as carbohydrate, reducing sugars, starch, amylase activity, chlorophyll and nitrogen were estimated. Total Soluble Carbohydrates was estimated with Anthrone reagent (Witham, *et al*., 1971). Reducing Sugars was estimated by 3, 5 Di-nitro salicylic acid method (Lindsey, 1973). Starch was estimated by Acid hydrolysis method (McReady*et al*., 1950). Amylase activity was estimated by the method of Bernfeld , 1955. Estimation of Chlorophyll was done bythe method of Arnon, 1949. Nitrogen was estimated by Micro Kjeldhal method (Umbriet*et al.*, 1972)

RESULTS AND DISCUSSIONS

On quantifying bio chemical parameters such as total soluble carbohydrates, reducing sugars, starch and amylase activity some insights could be drawn on carbohydrate metabolism. This with nitrogen and chlorophyll estimations showed the manner in which the presoaking treatments influenced the plant metabolism. Compared with the untreated control leaf extracts of the weeds had a direct and beneficial effect. The results of the experiment revealed a considerable increase in total soluble carbohydrate content in *Bryophyllum* treatment. An increase of 91.3% was recorded in the treatment with this said class of extract (T2), followed by 87% with *Kalanchoe* (T4). The lowest carbohydrate content was recorded in the control where the soaking did not involve any extract (T1).

Cultivable land in the tropics is infested with a wide range of weeds which impose and direct or indirect problems to crop production and there fore it is imperative that we scan the issue again and come up with alternatives to deal with weed menace.On the basis of parameters such as carbohydrate, reducing sugar and starch content, and the estimation of nitrogen and chlorophyll composition and amylase activity, it is found that the treated plants were benefited by the application of extracts. The present study show a relatively a lesser growth promoting potential to the extract from this species than the other taxa tested. Though the leaf sap of this latex rich weed affected a marginal increase in growth, plants raised in the treatment showed increased amounts of nitrogen and photosynthetic pigments. That the seeds presoaked in the extract of this common weed showed minimal accumulation of starch and sugars against the afore said metabolites suggests that biocontents of *Calotropis*might have a preferential role on nitrogen metabolism as against a positive interference with carbohydrate synthesis and utilization.

Higher value (21.9%) of reducing sugars was recorded in *Bryophyllum*extract (T2) treated seedlings, as *Kalanchoe*treatment (T4) registered 15.1%. The lowest content of reducing sugars which is actually less than control (-10.1%) was noticed in the *Tephrosia* (T5) extract (Table-5). Starch content was lower by -51.6% in the treatment of *Bryophyllum* (T2) extract and by -38.9% in *Calotropis (*T3)) extract treatment. When compared with that of the other treatments and the control *Tephrosia* (T5) treatments showed higher amount of starch content in the seedlings (Table-1).

Amylase activity of seedlings calculated in terms of the rate of starch degradation *in vitro* showed that seedlings in *Bryophyllum*treatment (T2) were with higher amylase activity (68.4%) than the control. Enzyme activity was low in *Kalanchoe* and *Tephrosia* extract with 31.6% and 15.8% respectively (Table-2).Contrarily seeds treated with *Bryophyllum* extract showed higher amount of carbohydrate, reducing sugars, and chlorophyll content. Similar result was earlier reported by Mini, *et al.,* (1999) they observed that the treatments with *Bryophyllum* where the extract showed higher amount of carbohydrate content. The level of starch content was lower in plants treated in the treatment of *Bryophyllum* extract. Chinoy, *et al.*, (1999) had reported that the starch depletion associated with simultaneous increase in sugar concentration indicates a higher level of hydrolytic activity. It is possible that on a similar basis total soluble carbohydrates and reducing sugars were higher in our treated plants. That the amylase activity was higher in *Calotropis*and *Bryophyllum* extract treated seedlings holds substance to this view.

Data obtained on pigment composition and nitrogen content in treated plants. It may be found that the chlorophyll level as well as nitrogen status is higher in treatments fortified by the supplementation of plant extracts. Treatments with *Bryophyllum* (T2) (27.8%) and *Calotropis* (T3) (26.4%) extracts showed significant promotery effect on chlorophyll content compared with those of *Kalanchoe* (T4) (10.8%) and *Tephrosia* (T5) (16.9%) extract treatment and the control (T1) (Table-3).

Seeds treated with *Tephrosia*extract gave rise to plants with increased nitrogen content. This is can be correlated directly the high nitrogen fixing potential as leguminous plant species are proven green manure for a wide variety of crops (Wood stock, 1988). An analogous situation is quite likely in treatments where germination was higher and faster. From the results presented on the morphometric traits and biochemical parameters it may be concluded that extract of *Tephrosia* and*Kalanchoe* were relatively more suitable for increasing the productivity and growth of pearl millet.

Table 1 : Effect of weed leaf extract on Carbohydrate,Reducing sugar and starch content (mg/g. of fresh leaves**) *of Pearl millet***

Treatments	Carbohydrate	Reducing sugar	Starch
T_1	46^a	73^b	950^e
T_2	88^d	89^c	460^a
T_3	74^b	66^a	580^b
T_4	86^d	84^c	630^c
T_5	78^c	65^a	740^d

Means followed by a common letter(s) in the same column are not significantly different at the 5 % level by DMRT

Treatment:

T1 Control; T2 Bryophyllum;T3 Calotropis ; T4 Kalanchoe; T5 Tephrosia

Table 2 : Effect of weed leaf extract on Amylaseactivity (mg maltose liberated/g. fresh wt./h. **) *of Pearl millet***

Treatments	Amylase activity
T_1	38
T_2	12
T_3	15
T_4	26
T_5	32

Means followed by a common letter(s) in the same column are not significantly different at the 5 % level by DMRT

Treatment:

T1 Control; T2 Bryophyllum;T3 Calotropis ; T4 Kalanchoe; T5 Tephrosia

Table 3 : Effect of weed leaf extract on Chlorophyll, and nitrogen content (mg/g. of fresh leaves**) *of Pearl millet***

Treatments	Total chlorophyll (mg/g. of fresh leaves)	Chlorophyll(a) (mg/g. of fresh leaves)	Chlorophyll(b) (mg/g. of fresh leaves)	Nitrogen (mg/g. of dry leaves)
T_1	5.90^b	4.29^a	3.36^a	32^a
T_2	7.54^c	5.53^b	4.23^b	84^b
T_3	7.46^c	5.53b	4.27^b	108^d
T_4	6.54^a	4.70^a	3.73^a	94^c
T_5	6.90^b	5.13^b	3.86^a	132^e

Means followed by a common letter(s) in the same column are not significantly different at the 5 % level by DMRT

Treatment:

T1 Control; T2 Bryophyllum;T3 Calotropis ; T4 Kalanchoe; T5 Tephrosia

CONCLUSION

- In the present investigation involving four types of leaf extracts on seed germination and growth of seedlings in pearl millet, each leaf extract had its own characteristic influence in increasing or decreasing a particular parameter.
- *Bryophyllum* extract treated seedlings showed maximum carbohydrate, reducing sugar, and amylase activity. Chlorophyll content of plants emerging from pre sowing treatments were high in emergent plants while nutrient profile of the soil sprayed with this extract remained rich.

- *Calotropis*extract treated seedlings showed higher value of chlorophyll content.
- *Kalanchoe* extract treated seedlings revealed low level of amylase activity.
- Seeds treated with *Tephrosia*extract favorable to starch amylase activity and high nitrogen levels.
- The positive influences on biochemical parameters comply well with growth promotive effects of extracts.
- Green manuring with low concentration of leaf extracts from common weeds thus proves beneficial to the growth of pearl millet. Therefore the preposition of utilizing weed plants in organic farming that holds promise in downsizing the use of agro chemicals demands further research and more detailed investigations.

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