Effects of toxic metal "Copper" on biophysical and biochemical parameters of *Vigna mungo* and its adsorption by egg shell powder.

JINNAH UNIVERSITY FOR WOMEN, PAKISTAN

SHABANA ASKARI & SYEDA SADAF ALTAF

author:-rzrizvi@hotmail.com & Sadaf_syeda@hotmail.com

EXPERIMENTAL PLANTS

Supplied with different concentrations of Copper as $CuSO_4$/Kg soil (0, 25, 50, 75 and 100ppm).

Copper is an essential micronutrient which promoted the seedlings growth at less than 50 µM concentration at 75 and 100 [ppm] growth was stunted and all biophysical and biochemical parameters were effected at higher concentrations of copper.

TREATED PLANTS

Supplied with different concentrations of Copper as $CuSO_4$/Kg soil (0, 25, 50, 75 and 100ppm) and treated with Egg shell powder.

Application of 10gm egg shell powder per kg soil to all applied levels of copper significantly reduced the toxic effects of copper and enhanced the biophysical and biochemical parameters of plants by adsorption of copper.

Methods and Materials

The present research was planned to evaluate the adsorption potential of egg shell powder for toxic metal "Copper" in *Vigna mungo*. The seeds were sown in randomized block design supplied with different concentrations of Copper as $CuSO_4$/Kg soil (0, 25, 50, 75 and 100ppm). Adsorption of copper was carried out by the application of 10gm egg shells powder/ kg soil to all applied levels of copper. The plants were harvested after 25 days. Various biophysical and biochemical parameters like shoot length, root length, Carbohydrate content by Yemm and wills, 1945 method and Total protein by Lowry's, 1951 method they were pragmatic to evaluate the efficiency of egg shell powder for adsorption of $CuSO_4$ with references to *Vigna mungo* growth. Aim of current research was mainly focused on the improvement of crop productivity of agricultural land by adsorbing toxic metal copper from the soil by a free of cost adsorbent (Eggshells) which may be collected in bulk amount from hotels, restaurants and bakeries and off course from the residential areas.

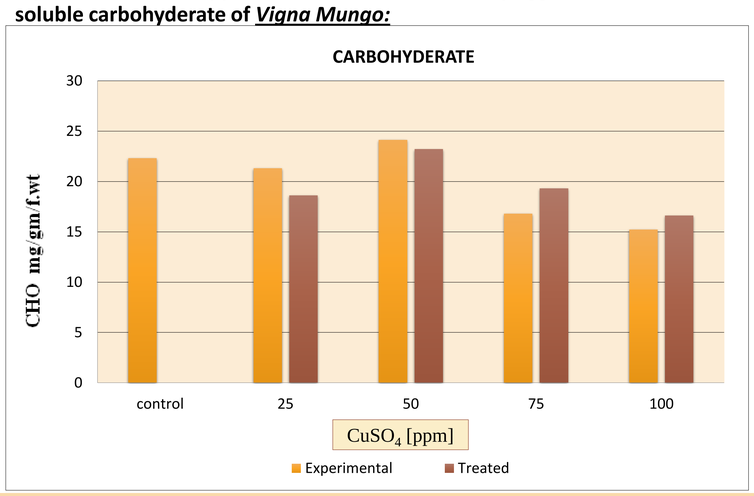
Figure 3. Stock solution of different concentrations of copper.

Figure 4. Egg shell powder.

Table 1: **Effect of copper on Biophysical and Biochemical parameters of *V. mungo* & its adsorption by egg shell powder:**

Cu [ppm]	Shoot Length (cm)		Root Length (cm)		Carbohydrates (mg/gm F.wt)		Proteins (mg/gm F.wt)	
-	Exp	Treated	Exp	Treated	Exp	Treated	Exp	Treated
0	13.5±0.49	13.5±0.49	15.7±0.5	15.7±0.5	22.3±2.7	22.3±2.7	67.75±4.3	67.75±4.3
25	14.85±0.66	15.5±0.43	16.35±3.4	17.86±4.5	21.3±3.7	18.6±2.6	67.25±7.8	65.93±57.9
50	15.8±1.39	16.1±0.91	17.78±2.6	20.25±4.1	24.1±9.3	23.2±9.5	68.7±1.2	71.7±6.7
75	12.7±0.39	13.2±0.86	14.3±1.5	14.5±2.79	16.8±1.3	19.3±7.5	51.6±15.7	56.3±9.3
100	11.58±0.87	12.8±0.52	12.13±2.5	14.48±4	15.2±2.06	16.6±2.2	56.2±4.9	60.4±4.9

Figure 1. Effect of Copper Sulfate And Its Removal by Egg Shell Powder on soluble carbohyderate of *Vigna Mungo:*



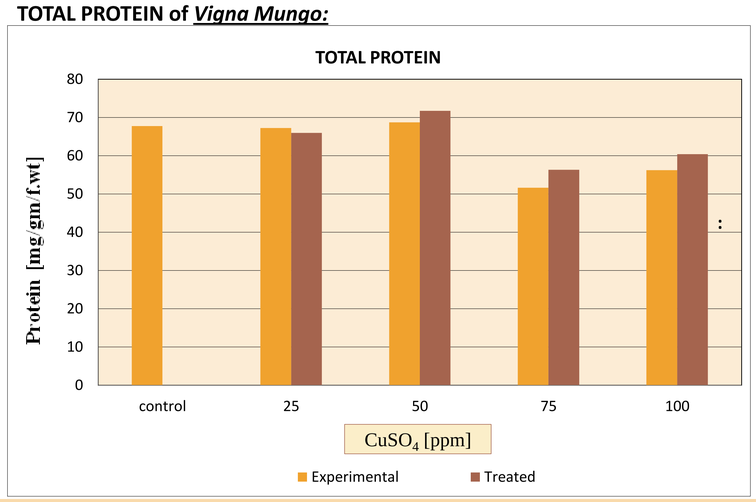
Results and Discussion

Present study showed that the shoot length of *Vigna mungo* increased at lower concentrations of $CuSO_4$, whereas it was significantly inhibited at higher concentrations as compared to control (Sarmishta, 2014). As data shown in table. 1, This improvement may attribute to the presence of macro and micronutrients and most importantly calcium ions in egg shell powder which activates various enzymes and cell wall formation (Li, 2017; Peter, 2005). Current data also revealed that root length of *Vigna mungo* increased markedly at lower concentrations but it was significantly inhibited at higher concentrations of $CuSO_4$ (table 1). Egg shell powder provides Calcium which is supposed to be a fundamental growth regulator of plants (Peter, 2005) as it is involved in activating certain enzymes for cellular activities (Li, 2017; White, 2003).Carbohydrate is the photosynthetic product. Data presented in Fig-1 showed that Carbohydrate contents were significantly declined in *Vigna mungo* at all applied concentrations of copper sulphate, $CuSO_4$. Accumulation of copper inhibits photosynthesis in plants which ultimately causes reduction in carbohydrates (Badr et.al., 2004). Reduced Carbohydrate contents due to copper accumulation were significantly improved by the application of egg shell powder because Egg shell provides calcium to the plants which not only involved in activation of enzymes, cell wall formation but also involve in the electron transport chain of photosynthesis (Peter, 2017; Xu, 2013). Data presented in figure 2 revealed that protein contents in *Vigna mungo* decline significantly at all applied levels of copper except at the concentration of 50 ppm. Proteins participate in numerous physiological functions in plants (Printz, 2016: Singh and Tewari, 2003) but their excess amount may be harmful or even lethal (Inmaculada et. Al,1996). Application of egg shell powder to the *Vigna mungo* growing under copper stress remarkably enhanced the protein contents. This improvement in protein contents may attribute to the presence of calcium and various other macro and micronutrients in egg shell powder.

Conclusion

It is concluded that Egg shell powder is an efficient, free of cost and abundantly available adsorbent and these results strongly suggest credible reuse of calcinated eggshell in the removal of copper. Egg shell should be used as an effective fertilizer as it also contain various organic and inorganic substances.

Figure 2. Effect of Copper Sulfate and its removal by Egg Shell Powder on TOTAL PROTEIN of *Vigna Mungo:*



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