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Efficacy Study of Copper Nano particle on plant System

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ABSTRACT

We all know that nanoparticles have the unique property of w/v more surface area and this property can be used in the field of agriculture research. In our research we have used custom made coppernanoparticle with respect to conventional copper salt. We have performed some pot experiment with our plant material, Rapeseed (Brassicanapus) and treated plant with coppernanoparticle solution as well as conventional copper salt at recommended dose of 0.05ppm for increased crop yield and productivity. Above the 0.05ppm of conventional $Cuso_4$ it was know to have toxic effect on plant morphology as well as physiology, rather than of it CuNP treated plant does not show any toxicity symptoms.CuNP treated plant increased root and shoot length of B.napus with respect to control.CuNP treated plant does not show any toxicity symptoms both in leaf and root at higher conc. (above 0.05ppm)and all plants are healthy. So the result indicates that CuNP work better than the conventional copper salt.

Key words; - *NP (Nanoparticle), $Cuso_4$ (copperSulphate), OD (Optical Density), XRD (X-ray Diffraction)SD (Standard Deviation*

1. INTRODUCTION:-

Nanotechnology can be defined as the manipulation of atom by atom from the material world by the combination of engineering, chemical and biological approaches. Application of nano scale material and structures are usually ranging from 1-100 nm and is emerging area of nanoscience and nanotechnology (Catauro*et al.*, 2004; Crabtree *et al.*, 2003). Nanotechnology is a revolutionary field just at its onset, the trend in the next decades being its integration with the green chemistry approach. Although nanoparticles can be synthesized through array of conventional methods green synthesis routes are good competent over the physical and chemical techniques. Copper nanoparticle can be applied in catalysts, molecularsieves, ion-sieves, batteries, magnetic materials as well as other applications such as water treatment, imaging contrast agents due to their excellent physicochemical properties (Reddy and Reddy, 2004; Chen et al., 2005). Although there are several reports of green synthesis of coppernanoparticles in different manner, using plant extract reduction and stabilization of copper metal into nanoparticle is the environment friendly, cheapest and simplest method in the view of green chemistry as discussed above (Satish*et al.*, 2013; Begum *et al.*, 2011; Philip *et al.*, 2011).

2. MATERIAL, METHOD OR EXPERIMENT:-

2.1 Copper Nanoparticle:- custom-made copper nanoparticle was purchased from M.K. Implex, Canada. The surface morphology was determined by field emission scaning electron microscope and particle size was observed through transmission electron microscope (TEM) (JEOL 2010F).XRD measurement was performed. The surface functional group was determined by fouier infra-red spectroscopy.

2.2 Plant material and growth conditions:-seed of Brassica napus was purchased from berhampur 0pulse and oil research centre, west Bengal. seed were soaked in 5% sodium hypochloride solution for surface sterilization and imbibed with the treatment solutions (control:contol without coppersolution, copper nanoparticle:0.05ppm,0.1ppm,0.5ppm and 1ppm; Cuso4 :0.05ppm,0.1ppm,0.5ppm and 1ppm)after 24 hour of germination seeds were planted in pots filled with perlite supplemented with hoagland's solution with or without copper solution for 15 days in growth cabinetwith 14hour day,25^{o}c:night temp.of 20^{o}c and RH 40to 60%.

2.3 Estimation of amino acid, total carbohydrate,lipid and protein content:-AA content in plant material was estimated according to the ninhydrin method of lee and takahashi (1996) with some modification. protien contents of leaves and roots of treated plant were estimated according to Lowry method. Lipid content was estimated according to Bligh and Dyer's protocol. Total carbohydrate content was estimated by Anthrone method.

2.4 Estimation of carotenoid content:-carotenoid was estimated according to the method of Davies (1965) with little modification.

3. PLANT BIOSAFETY:-

3.1 Estimation of proline content:-estimation of proline was done according to the method of Bates et al(1973) the quantity of proline present in tissue was calculated from the standard curve prepare by OD values of known concentration of proline solution.

3.2 Estimation of phenol contents:-phenol contents was estimated according to the method of Malik and Singh (1980)

3.3 Estimation of poly phenol oxidase content:-polyphenoloxidase enzyme activity was assayed according to the method of Mayer and Harel (1979) with some modification. Specific activity of enzyme was expressed in terms of change in OD at 480nm/hr/mg protein.

3.4 Estimation of super oxide dismutase (SOD) Content:-the initiation and termination of the reaction and other schedules was as described by Glannopolities and Rie. (1977) protein content of enzyme was estimated according to Lowry *et al* (1951).

3.5 Estimation of catalase (CAT) content:-the activity of CAT was assayed according to Beers and Sizers. Enzyme specific activity was expressed as mm of H_2O_2 oxidized/min/mg protein.

3.6Estimation of Glutathione reductase (GR) Content:-Glutathione reductase was assayed according to Schaedle and Barsham. The specific activities of enzyme were expressed as µmol NADPH oxidized/min.

4.RESULT:-

Copper, an essential plant micronutrient,had positive impact on plant growth and development,specifically in plant morphology when applied in low concentration .as suggested by various literatures,coppersulphatesqalt(Cuso4) was used as conventional copper salt at recommended dose of 0.05ppmfor increased crop yield and productivity.at and above the concentration of 0.5ppm,it was known to have toxic effect on plant morphology as well as physiology.as shown in table no.01,0.05ppm concentration of manganese nanoparticle was the most effective dose among the nanoparticle as well as Cuso4 treatment CuNP at 0.05ppm dose increased root and shoot length of Rapeseedplant 38.83% and 21.72% respectively with respect to control. Fresh and dry weight of CuNP treated plantat 0.05ppm concentration increased 29.72% and 53.6%respectively with respect to control. This increment in root and shoot length as wellas fresh and dry weightwere probably due to enhanced photosynthesis and /or increase synthesis of antioxidant in plant.CuNP treated plant does not show any toxicity symptoms both in leaf and root at higher concentration and all plant were healthy.Cuso4 plant at higher doses treatment (0.5ppm or above)as well as Copper deficient plants showed severe toxicity symptoms like become necrotic,root were brown and gradual disappearance of rootlet were evident after 15 days treatment.

Table No. 1 -Different parameters of plant morphology

Treatment	Root length(CM)	S D	shoot length (cm)	S D	fresh weight(gm)	S D	dry weight(gm)	S D
Control	4.3667	0.206	6.3625	0.51	0.3156	0.0194	0.02506	0.004
CuNP 0.05PPM	6.0625	0.447	7.7444	0.702	0.4094	0.0086	0.038493	0.008
CuNP 0.1PPM	5.9571	0.496	7.6375	0.6	0.3702	0.0015	0.02822	0.003
CuNP 0.5PPM	5.65	0.288	6.98	0.447	0.3457	0.0073	0.0261	0.003
CuNP 1PPM	5.48	0.349	6.5143	0.204	0.3306	0.0121	0.025173	0.002
CuSO4 0.05PPM	5.9643	0.014	7.0333	0.418	0.3783	0.0066	0.024265	0.002
CuSO4 0.1PPM	4.2111	0.267	6.7	0.141	0.3533	0.0111	0.01986	0.001
CuSO4 0.5PPM	4.58	0.356	6.28	0.192	0.323	0.006	0.0188	0.001
CuSO4 1PPM	3.44	0.288	5.82	0.192	0.303	0.005	0.0165	0.001

5.CONCLUSION: -

Ina nutshell, copper nanoparticle have very positive impact on plant system as per our research work. The effect of coppernanoparticle on Rapeseed(Brassica napus) is very promosing and it has been observed that coppernanoparticle work better than the conventional copper salt. The plants are healthy and tall compare to control as well as elemental treated plants. The basic parameters of plant system i.e. amino acid, sugar, protein and lipid content are more or less same. In some case it increase which is good for the biological system.intrestinglynanoparticles at higher doses are not at all toxic to the plant whereas in Cuso4treated plant, higher doses are detrimental to the plant system. The high value of chlorophyll in nanoparticle treated plant suggests the higher activity of photosynthesis.In future coppernanoparticle can be used as enhancer of photosynthesis in the plant system. This particle can be used as nano-fertilizer in future. Though much more experiment need to be done before making conclusion.

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REFERENCES:-

[1] Alger JR, Frank JA,. The utilization of magnetic resonance imaging in physiology.Annu rev physiol. 1992;54:827-46

[2] apply nanotech to up industrial, agri output, the daily star (bangladesh), 17april2012.

[3] binnig, G.; Rohrer, H. (1986)."Scanning tunneling microscopy".IBM journal of Research and development 30:4.

[4] Bogdanov A jr, Mazzanti ML. Molecular magnetic resonance contrast agents for the detection of cancer:past and present. SeminOncol. 2011;38:42-54

[5] Cristina buzea, ivanpacheco, and kevinrobbie(2007)."nanomaterials and nanoparticles:sources and toxicity".Biointerphases2(4):MR17.doi:10.1116/1.2815690.PMID20419892.

[6] Cleary K, Peters TM. image-guidedinterventions:Technology Review and clinical applications. Annu Rev Biomed Eng. 2010;12:119-42

[7] Drexler, k. Eric (1992).nanosystem:molecularmachinary, manufacturing,andcomputatin.newyork:johnwiley&sons.ISBN 0-471-57547-X.

[8] Girardot C, boukobza M, Lamoureux JP, Sichez JP, Capelle L, zouaoui A. Et al. Choroid plexus papillomas of the posterior fossa in adults; MR imaging and gadolinium enhancemen.Report of four cases and review of the literature.J Neuroradial. 1990;17:303-18

[9] Kroto, H. W.; halth, j. R.; O'Brien, S. C.; curl, R.F.; Smalley, R. E. (1985)."C60:Buckminsterfullerene".nature318(6042):

[10] P. 1916.doi:10.1126/science.1122120.PMID13.16373566.

[11] "Nanotechnology :Drexler and smalley make the case for and against 'molecular assemblers'". Chemical &Engineering News(American chemical society) 81(48:37-42.1 december 2003.doi:10.1021/cen-v081n036.p037.Retrieved 9 may 2010.

[12] "Nanotechnology andnanoscience:apportunities and uncertainities".Royal society and Royal Academy of Engineering. July 2004.Retrieved 13 may 2011.

[13] "Nanotechnology Informationcenter:Properties,Application, Research, and safety Guidelines".American Elements. Retrieved13 may 2011.

[14] Niendorf HP, Felix R, Laniado M, Schorner w, Kornmesser W, claussen C. Magnetic resonance imaging of intracranial tumors using GADOLINIUM-DTPA. initial experience with fast imaging. ActaRadiol suppl. 1986;369:561-3

[15] Pishco GL, Astary GW, Mareci TH, sarntinorannont M. Sensitivity analysis of an image-based solid tumor computational model with heterogeneous vasculature and porosity. Ann Biomed eng. 2011;39:2360-73

[16] "Press Release: the 1986 nobel prize in physics". Nobel prize. Org. 15 october 1986.Retrieved 12 may 2011.

[17] Saini, rajiv; saini, santosh, sharma, sugandha(2010)."nanotechnology" the future madicine". Journal of cutaneous and aesthetic surgery3(1): 32-33.doi:10.4103/0974-2077.63301.retrieved january 23,2013.

[18] Xie J, Liu G, Edden HS Ai H, Chen X. Surface engineered magnetic nanoparticleatforms for cancer imaging and therapy. Acc chem Res. 2011;44(10):883-92

[19] Xie J, Huang J, Li X, sun s, chen x,. Iron oxide nanoparticle platform for biomedical applications.Curr Med Chem. 2009;16;1278-94