# EXTRACTION AND IDENTIFICATION OF PLANT GROWTH HORMONES FROM RECYCLED WASTE MATERIALS AND THEIR EFFECT ON GROWTH AND YIELD OF MAIZE

**Kodwo, Meizah**

**2007**

## ABSTRACT

The presence of plant growth hormones in compost or co-compost prepared from Human excreta and/ or municipal solid waste and their effect on the growth and yield of maize was studied. Samples of compost and co-compost were obtained from composting site at Buobai near Kumasi. Water (deionised) or 80% methanol (chilled) extracts were prepared from the composts or the co co-compost for the isolation and identification of plant growth substances. The methanol extracted plant growth hormones fraction was further partitioned into cytokinin (fraction) using ethyl acetate and n-butanol; auxins (fraction) using diethyl ether; and gibberellins (fraction) using sodium hydrogen carbonate and n-butanol. Each fraction was further separated into components using thin layer chromatography (TLC). The thin layer chromatographic separations were done alongside the respective standard plant growth hormones (co-chromatography). Five different concentrations of each standard plant growth hormone, benzyl amino urine (BAP), gibberellic acid (GA3) and indole-3-acetic acid (IAA) were prepared and used in a bioassay test to compare the effects and concentration of extracted plant growth hormones from the compost and co-compost. The colour of the separated plates or chromatograms together with the Rf values were used in the identification of the plant growth hormones. The presence of some plant growth hormones in the extracted samples from compost and co-compost was confirmed using the relative fluidity, Rf values of co-chromatography using a standard hormone ad the extracted phytohormones. In addition, the colour of spot when sprayed with bromophenol blue, water: $H_2SO_4$ (9:1) and ammonia exposure was also used in the identification process. The Rf values of the standard hormones corresponded to some of the separated cytokinins and auxins spots in both compost and co-compost. Gibberellins gave yellow-green colour with $H_2SO$: $H_2O$ (7:3, V/V); Cytokinins were detected as blue spots with bromophenol blue and auxins were also detected as brown spots with ammonia complex. These results indicated the presence of plant growth substances like IAA, GA3 and cytokinins. The most diluted water extract (25% of the extract) from both compost and co-compost stimulated elongation of coleoptiles and radicle than the other concerntrations (50%, 75% and 100% of the extract) and the control.

In co-compost, the concentration of plant growth hormone was found to be 68.3mg/kg to 345.4mg/kg for auxins, 61.9mg/kg to 185.8mg/kg for cytokinins and 250.4mg/kg to 312.7mg/kg for gibberellins. In compost 42.0mg/kg to 248mg/kg for auxins, 33.1mg/kg to 198.2mg/kg for cytokinins and 10.1mg/kg to 200.2mg/kg of gibberellins were estimated. In the pot experiment where the effect of the plant growth hormones on growth and yield of maize was studied, it was found out that the extracted, auxins, cytokinins and gibberellins from both compost and co-compost all stimulated elongation of maize shoot over the controls. Among the extracted plant growth hormones, gibberellins from compost, best stimulated plant height; increases of 217% over the soil alone (control), and 48% over the ammonia sulphate and NPK (control) were recorded. Auxins from compost least stimulated stem elongation recording 174% increase over the soil alone (control), and 5% over the ammonium sulphate and NPK (control). It was noted that the gibberellins extracted from the co-compost of Rf zone 2 with Rf value of 0.5267 promoted shoot elongation more than all the separated spots from the TLC. However, standard gibberellins promoted elongation of shoot than the gibberellins extracted from co-compost. The extracted hormones stimulated internode elongation, leaf elongation and width growth, root growth, early tasselling and silking.

The extracted cytokinins, stimulated chlorophyll synthesis more than the rest of the plant growth hormones. All plant growth hormones from co-compost stimulated the production of bigger and heavier maize grains. The highest yield of 2.501tonnes/ha was obtained by treating plant with auxins extracted from co-compost as compared to 1.947 tonnes/ha and 1.073tonnes/ha obtained by treating plant with the standard hormone and the control, respectively. The study revealed that though plant growth hpormones regulate growth and yield of plant, they do not perform these functions in isolation and the application of plant nutrients may be important.

**SUPERVISORS**

**Dr. John Ofosu Anim**

**Dr. Kwabena Ofosu-Budu**

**Prof. L. Enu Kwasi**