ABSTRACT

Humic acids are heterogenic mixtures of polycarboxy polyphenolic supramolecular substances with a range of molecular weight. Fulvic Acids differ from Humic Acids having lower molecular weights, more carboxyl groups and more acidic strength. These substances find extensive application in agriculture as soil conditioner, nutrient carrier, chelating agents, plant growth promoters and phosphate solublizing agents. Already known coal rich regions in Pakistan were resurveyed to find out humic acid containing lignite. Out of 121 samples collected from all over the Pakistan only 26 samples conained humic acids; a sample from Makkarwal (Punjab) being the richest i.e. 64% humic acid followed by a sample collected from Chamalang (Baluchistan) having 61% humic acid content.

As the natural sources of humic acids are limited and cannot meet the growing demand in the agriculture sector, so different coal samples and were investigated to produce humic acids by controlled oxidation of coal. Non-humic sub-bituminous coal from Dukki (Baluchistan) was found most suitable for oxidation to produce humic acids. Eight different methods were tried to convert the low grade coal to humic acids.

Chlorine dioxide was used for oxidation of coal to produce humic acid. By this process 76 % coal was converted to humic acids. In a fixed bed reactor oxygen gas was used to produce humic acids by oxidative degradation of coal at elevated temperature. The Oxygen gas containing 0.3% moisture content at 140°C gave 47% conversion yield in 20 hours.

Oxidation of coal slurry using oxygen as oxidant was found to be very much dependent on temperature. At 80°C, the maximum yield of 64% could be achieved.

Coal was oxidized by potassium permanganate both in alkaline and acidic conditions. Oxidation of coal with alkaline potassium permanganate at 55°C for two hours converted 66% coal into humic materials. Oxidation of coal by HNO_3 converted 78.7% coal to humic acids at 70°C in eight hours. Oxidation with Hydrogen peroxide gave 31% humic acid yield at 80°C. Reasonable yield of humic acids was obtained by electrolytic oxidation of coal both in acidic and alkaline conditions.

ne oxidative degradation of alkali soluble supramolecular humic acid to water soluble lvic acid molecules was achieved by electrolysis of aqueous solution sodium humate nd thermal cracking of humic acids. The activation energy of the oxidative degradation f humic acids to Fulvic Acids was found to be 10.61 K.cal/mole.

pplications of humic acids and fulvic acids were studied on different crops and plants. oaking *Cucurbita* seeds in fulvic acid solution enhanced their rate of germination. ddition of humic acids along with NPK fertilizers significantly increased the yield of angoes, sweat peas, wheat, maize, sugarcane and rice.