

## ***SUMMARY***

In the present work, the lignocellulosic materials of soybean straw and artichoke residues have been investigated and more information were obtained about their pretreatment and chemical features of these agricultural wastes. Besides, cellulase complex enzymes were evaluated to obtain optimum conditions. Saccharification process was carried out using these enzymes to convert cellulose polysaccharides of the abovementioned lignocellulosic materials to glucose and cellobiose syrup.

The obtained results indicated that soybean straw and artichoke residues contained a high percentage of cellulose and hemicellulose polysaccharides i.e. (39.5, 23.6%) and (26.3, 27.00%). Pretreatment of the abovementioned lignocellulosic materials with NaOH or NH<sub>4</sub>OH was achieved to convert the crystallinity structure of these polymers to amorphous state to enhance the enzymatic attack toward these polysaccharides. The results indicated that pretreatment of lignocellulosic materials with NH<sub>4</sub>OH showed a higher yield of cellulose with higher impurities at different concentrations and temperatures comparing with NaOH pretreatment.

Saccharification process was carried out using different pretreated lignocellulosic materials by cellulase enzyme (celluclast 1.5L).

The results indicated that the saccharification rate was higher at pretreatment with 3M of NaOH or NH<sub>4</sub>OH ( for 3h. at 80°C ) than other pretreatment ( 1M for 24h. at room temperature )

### *Effect of different conditions on the reaction velocity and activity of cellulase enzyme (Celluclast 1.5L)*

#### *Effect of enzyme concentration :*

The effect of enzyme concentration on the reaction activity by using carboxymethyl cellulose (CMC as standard) and extracted cellulose from lignocellulosic materials were studied. The results indicated that the reaction activity reached its maximum at concentration of 48.86  $\mu\text{M/L/min}$  with enzyme concentration equalled to 300  $\mu\text{L}/100\text{ ml}$  buffer for CMC and 44.32 , 34.05  $\mu\text{M/L/min}$  with enzyme concentration 400  $\mu\text{L}/100\text{ml}$  buffer for artichoke residues and soybean straw.

#### *Effect of pH.*

The effect of pH values on the enzyme activity indicated that the optimum pH was 4.2 for CMC while that for lignocellulosic materials was 4.8.

#### *Effect of temperature*

The effect of temperature on the reaction activity of cellulase enzyme were studied . The optimum temperature was 55°C with CMC while, the abovementioned lignocellulosic materials gave a maximum enzyme activities at 50°C.

### **Effect of substrate concentration :**

The effect of substrate concentration using (CMC as standard) and extracted cellulose of different lignocellulosic materials on the activity of cellulase enzyme complex (celluclast 1.5L) indicated that the maximum reaction velocity ( $V_{max}$ ) of CMC, artichoke residues and soybean straw were (2154.04  $\mu\text{M/L}$ ), 1842.34 $\mu\text{M/L}$ , and 1237.48 u /L, respectively.

On the other hand, Michelis constant ( $K_m$ ) values of cellulase for the abovementioned substrates were 0.34, 0.29 and 0.38g/100ml. respectively.

### **Enzymatic saccharification of different pretreatment cellulosic materials.**

The acquired results of saccharification process for different lignocellulosic materials indicated that the maximum values of saccharification process was 89.8% for extracted cellulose of soybean at substrate concentration of 2% after 48h. under optimum conditions of cellulase enzyme. While, the maximum values for extracted cellulose of artichoke residues equalled to 87.18 and 88.84 at concentration of 2% for 24h and 48h, respectively under the same abovementioned conditions.