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**THE EFFECT OF MOLD, FERMENTATION TIME AND  
SUBSTRATE COMPOSITION OF PALM KERNEL CAKE ON  
CELULOSE AND MANANNASE ENZYME ACTIVITIES**

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# BACKGROUND

**FEED COST of  
POULTRY  
is HIGH**

**PALM KERNEL CAKE (PKC)**

## POTENTIAL

- PALM OIL PRODUCTION 23 TONS
- INCREASE EVERY YEAR (18%)
- HIGH PROTEIN (20,04 %)
- AS A FEED STUFF FOR LIVESTOCK

## CONSTRAINTS For POULTRY

- HIGH FIBER (21.75%)
- LOW DIGESTIBILITY (53%)
- HIGH MANAN CONTENT ( 50% from Fiber)
- Usage 5 - 10 % IN POULTRY RATION
- LOW AMINO ACID

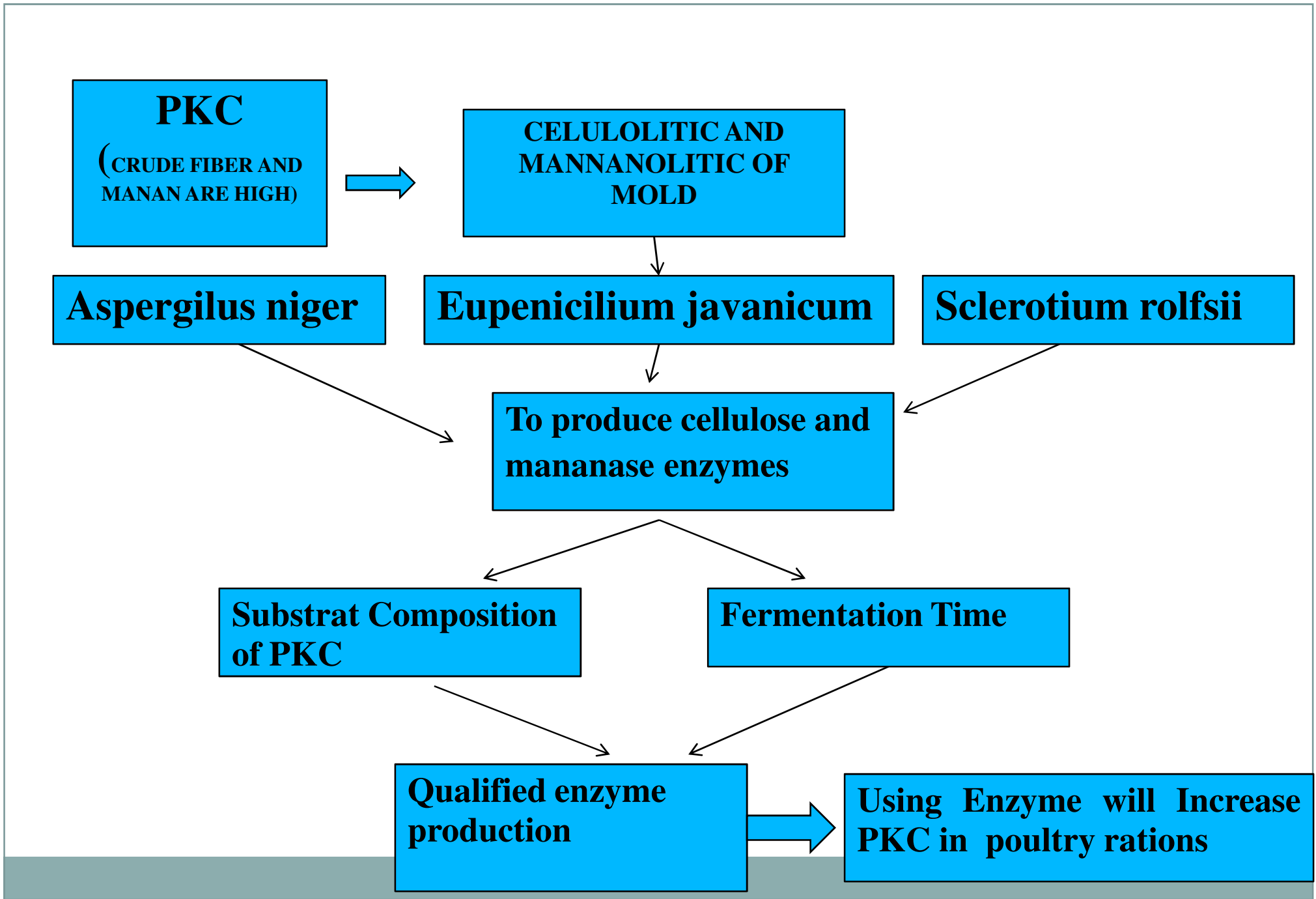
**BIOTECHNOLOGY  
FERMENTATION  
With M.O. CELULOLITIC  
and MANANOLITIC**

## **PROFIT**

- DECREASE CRUDE FIBER(11.37%)
- INCREASED CRUDE PROTEIN PK (26.27%,

## **WEAKNESS**

**USAGE IN LIMITED RATION FOR POULTRY (17%), BECAUSE IT CONTAIN NUCLEIC ACID**



## **THE AIM OF EXPERIMENT**

**The aim of this study was to determine the type of mold cellulolytic and mannanolytic (*Aspergillus niger*, *Eupenicillium javanicum* and *Sclerotium rolfsii*), substrate composition of PKC and the optimum fermentation time on the activities of cellulase, mannanase and protease enzyme so as to increase the use of PKC in poultry rations.**

# THE EXPERIMENTAL METHOD

- The experiment used a Completely Randomize Design (CRD) in a 3x3x3 factorial with 3 replications
- The First Factor: various types of mold (1. *Aspergillus niger*, 2. *Eupenicillium javanicum*, 3. *Sclerotium rolfsii*)
- The Second Factor: Substrate composition (1. 5% PKC, 2. 8% PKC, 3. 11% PKC)
- The Third Factor: Fermentation Time ( 36, 48, 60 hours)
- Parameters : Enzyme activity of cellulase, manannase and protease from fermented Palm Kernel Cake.

# RESULT OF EXPERIMENT

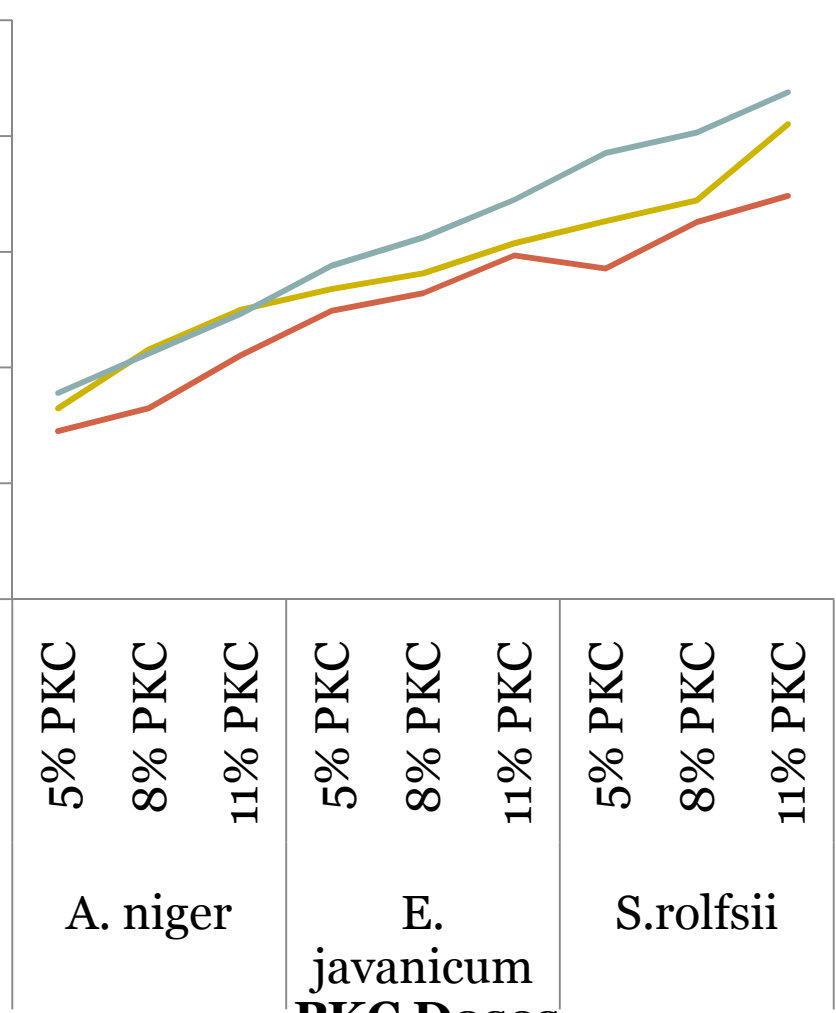
Variables	Types of Molds	Substrate Composition	Fermentation Time		
			36. hours	48 hours	60 hours
Cellulase	<i>Aspergillus niger</i>	5% BIS	7.25 <sup>x</sup>	8.24 <sup>w</sup>	8.90 <sup>v</sup>
		8% BIS	8.24 <sup>w</sup>	10.8 <sup>s</sup>	10.62 <sup>t</sup>
		11% BIS	10.52 <sup>u</sup>	12.50 <sup>p</sup>	12.31 <sup>r</sup>
	<i>Eupenicilium javanicum</i>	5% BIS	12.45 <sup>q</sup>	13.39 <sup>n</sup>	14.40 <sup>k</sup>
		8% BIS	13.22 <sup>o</sup>	14.07 <sup>m</sup>	15.62 <sup>h</sup>
		11% BIS	14.85 <sup>j</sup>	15.37 <sup>i</sup>	17.24 <sup>f</sup>
	<i>Sclerotium rolfsii</i>	5% BIS	12.28 <sup>l</sup>	16.32 <sup>g</sup>	19.26 <sup>d</sup>
		8% BIS	10.29 <sup>g</sup>	17.22 <sup>f</sup>	20.15 <sup>c</sup>
		11% BIS	17.42 <sup>e</sup>	20.51 <sup>b</sup>	21.89 <sup>a</sup>
Mannanase	<i>Aspergillus niger</i>	5% BIS	10.40 <sup>q</sup>	11.88 <sup>no</sup>	12.29 <sup>mno</sup>
		8% BIS	12.09 <sup>p</sup>	12.14 <sup>mno</sup>	13.94 <sup>k</sup>
		11% BIS	11.86 <sup>o</sup>	13.39 <sup>l</sup>	13.31 <sup>k</sup>
	<i>Eupenicilium javanicum</i>	5% BIS	12.40 <sup>m</sup>	14.83 <sup>kl</sup>	16.93 <sup>g</sup>
		8% BIS	12.37 <sup>l</sup>	15.10 <sup>j</sup>	18.99 <sup>e</sup>
		11% BIS	13.59 <sup>ij</sup>	14.55 <sup>j</sup>	20.55 <sup>d</sup>
	<i>Sclerotium rolfsii</i>	5% BIS	14.15 <sup>k</sup>	16.08 <sup>hi</sup>	20.71 <sup>cd</sup>
		8% BIS	16.20 <sup>h</sup>	18.63 <sup>ef</sup>	22.44 <sup>b</sup>
		11% BIS	18.40 <sup>f</sup>	21.20 <sup>c</sup>	24.58 <sup>a</sup>
Protease	<i>Aspergillus niger</i>	5% BIS	9.09 <sup>v</sup>	10.77 <sup>s</sup>	10.42 <sup>t</sup>
		8% BIS	10.44 <sup>t</sup>	11.20 <sup>r</sup>	11.40 <sup>r</sup>
		11% BIS	12.03 <sup>q</sup>	13.12 <sup>n</sup>	12.07 <sup>q</sup>
	<i>Eupenicilium javanicum</i>	5% BIS	10.05 <sup>u</sup>	12.66 <sup>o</sup>	14.49 <sup>l</sup>
		8% BIS	12.33 <sup>p</sup>	14.10 <sup>m</sup>	15.50 <sup>j</sup>
		11% BIS	14.04 <sup>m</sup>	15.20 <sup>k</sup>	16.10 <sup>h</sup>
	<i>Sclerotium rolfsii</i>	5% BIS	14.68 <sup>l</sup>	17.94 <sup>f</sup>	18.35 <sup>e</sup>
		8% BIS	15.84 <sup>i</sup>	18.58 <sup>d</sup>	20.31 <sup>c</sup>
		11% BIS	16.97 <sup>g</sup>	21.43 <sup>b</sup>	22.92 <sup>a</sup>

**Cellulase Enzyme Activities**

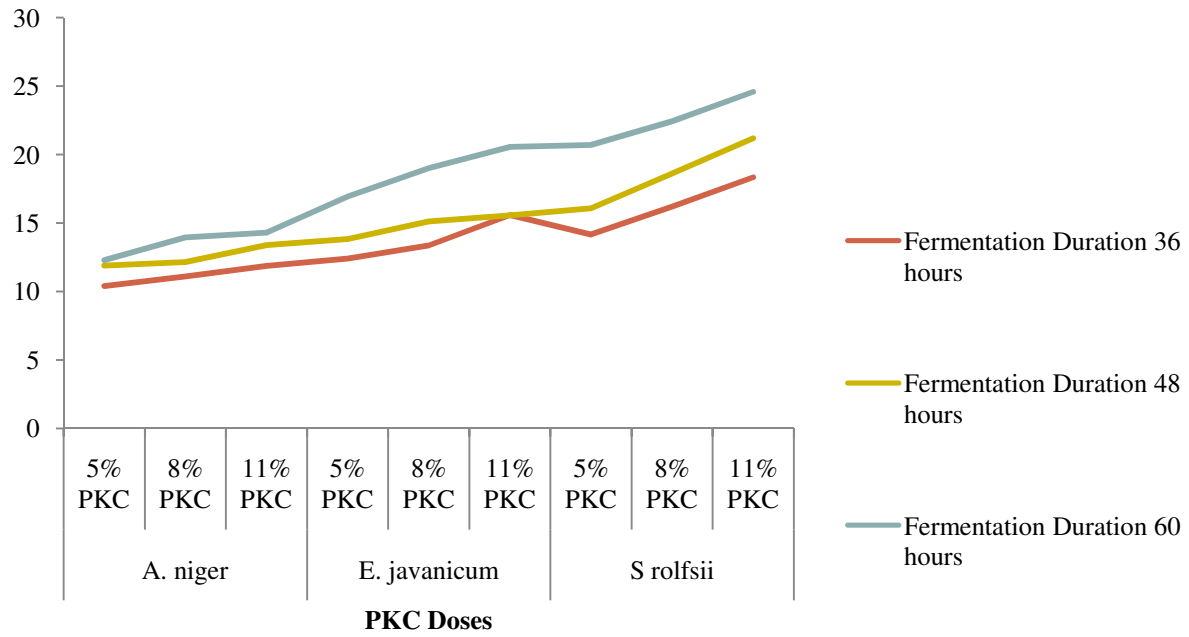
25  
20  
15  
10  
5  
0

5% PKC	8% PKC	11% PKC	5% PKC	8% PKC	11% PKC	5% PKC	8% PKC	11% PKC
A. niger			E. javanicum			S.rolfsii		
<b>PKC Doses</b>								

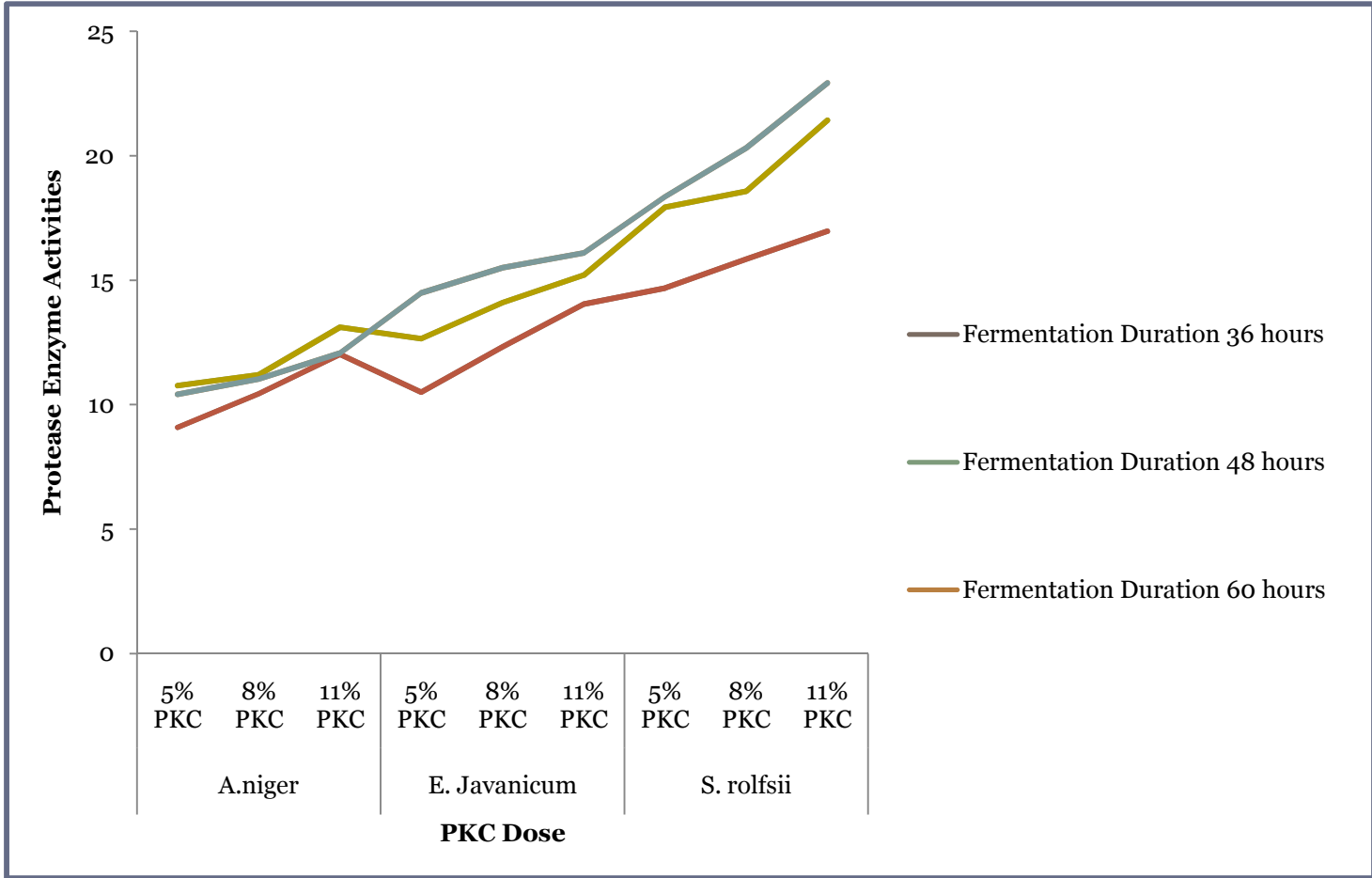
- Fermentation Duration 36 hours
- Fermentation Duration 48 hours
- Fermentation Duration 60 hours



**Mannanase Enzyme Activities**







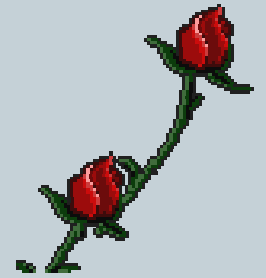
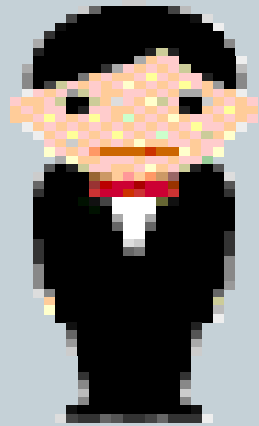
# CONCLUSION



The fermentation of PKC with *Sclerotium rolfsii* and substrate composition 11 % of PKC and Fermentation time 60 hours give enzyme activity of cellulose, mananase and protease better than *Aspergillus niger* and *Eupenicillium javanicum*. The activity of cellulase, mannanase, and protease are as follows: 20.74 U/ml, 9.81%, and 16.05 U/ml



THANK YOU



## 6. ATTACHMENT



***A. niger***

## 6. ATTACHMENT



***E. javanicum***

## 6. ATTACHMENT



**S. Rolfsii**





## **6. ATTACHMENT**



**Sterilization and autoclave**



## 6. ATTACHMENT



**Inoculation of Mold**