大葉大學九十學年度博士班招生考試試題紙				
所　　別	考　試　科　目 （中文名稱）	考試日期	節次	備註
食品工程	專業英文論文閱讀能力測驗	七月六日	一	共四頁

註：考生可否攜帶計算機或其他資料作答，請在備註欄註明（如未註明，一律不准攜帶）

1.筆試題目共有十題，任選五題作答。每題 20 分，合計 100 分。

2.作答方式：將英文摘要改寫成中文。

3.人名、專有名詞以及無適當中文翻譯之名詞，如菌種、酵素名稱等，可依原文寫出。

4.作答題數超過五題者，將按作答順序取前五題計分，其餘答案不予計分。

5.一律橫式作答。

題目：

1. Citric acid is finding new areas of use each year and the demand for the acid is constantly increasing. Being a bulk chemical, the continuous production of citric acid would be advantageous. The paper presents the results from ammonia limited batch and continuous fermentations using the yeast strain *Saccharomycopsis* (*Candida*) *lipolytica* (NRRL Y-7576). Mathematical models were developed for growth and glucose utilization in batch and continuous culture. Cell and acid yields appeared to be almost the same in batch and continuous culture. The specific production rates were found to be constant, equal to 0.053g/g h, in the batch fermentations but varied in the continuous experiments from 0 to 0.11 g/g h depending on the fermentation conditions. Continuous production in a single stage CSTR was studied for over 1,000 hours without shutdown.
   Index Entries:Citric acid; *Saccharomycopsis lipolytica*; *candida lipolytica*; continuous production; stirred-tank reactor.

2. Bioassays were conducted to test two isolates of *Metarhizium anisopliae* (Metschnikoff) Sorokin (IMI 350 394 and ZBW 9501) against adult *Heteronychus licas* Klug. In a bioassay, spore suspensions in distilled water of isolates IMI 350 394 and ZBW 9501 and a granule formulation of isolate ZBW 9501 were tested against fed adult beetles in plastic vials containing heat-sterilized soil at rates of 9.5×10^{6}, 1.1×10^{7} and 1.2×10^{8} conidia/insect, respectively. Whereas, no mycosed cadavers were recovered from the control treatment, the three fungus treatments caused 5, 10 and 35% mycosis, respectively, 22 weeks after inoculation. In another bioassay, the granulated fungus isolate ZBW 9501 was also tested against fed and unfed *H. licas* larvae in plastic vials containing heat-sterilized soil at the rate of 1.2×10^{8} conidia/larva. No mycosed cadavers were recovered from the control treatment, but the fungus treatment recorded 34 and 24% mycosis for fed and unfed larvae, respectively, 16 weeks after inoculation. For both larvae and adults the fungus-induced mortality period ranged from 2 to 16 weeks. The granulated fungus isolate ZBW 9501 applied in a small field trial at 8.2×10^{12} conidia/ha had no measurable impact on the pest ($P > 0.05$). The paper discusses some of the possible reasons for the poor efficacy and concludes that the isolates tested are probably weakly pathogenic and more virulent isolates with a greater epizootic potential must be identified before field testing.

Keywords: Black maize beetle; *Heteronychus licas*; *Metarhizium anisopliae*; Sugercane; Biological control; Soil insect

3. The rising need for new separation processes for the biotechnology industry and the increasing attention towards development of new industrial enzyme processes demonstrate a potential for the use of liquid membranes (LMs). This technique is particularly appropriate for multiple enzyme/ cofactor systems since any number of enzymes as well as other molecules can be co-encapsulated. This paper focuses on the application of LMs for enzyme encapsulation. The formulation and properties of LMs are first introduced for those unfamiliar with the technique. Special attention is paid to carrier-facilitated transport of amino acids in LMs, since this is a central feature involved in the operation of many LM encapsulated enzyme bio-reactor systems. Current work in this laboratory with a tyrosinase/ascorbate system for isolation of reactive intermediate oxidation products related to L-DOPA is discussed. A brief review of previous LM enzyme systems and reactor configurations is included for reference.

4. Methionine is a protective factor against various types of liver damage, but excessive dietary methionine is hepatotoxic. Because the mechanisms of L-methionine-related hepatotoxicity are poorly understood, the effect of long-term excessive L-methionine intake on the metabolism of iron and antioxidants was studied in rat liver to determine whether oxidative stress is involved. Wistar male rats were fed either an L-methionine-supplemented (16.0 g/kg) diet or a control diet for 1,3,6 and 9 mo. The growth rate of L-methionine-supplemented rats was significantly slower than that of controls. Iron, ferritin and thiobarbituric acid-reactive substances (TBARS) levels in the liver were greater in supplemented rats than in controls. Serum iron and transferrin levels were significantly lower in L-methionine-treated rats compared with controls. Serum ferritin did not differ between the two groups. Hepatic glutathione peroxidase activity, catalase activity and total glutathione concentrations were higher in rats fed the L-methionine diet at 1 and 3 mo, but not at 6 and 9 mo. These results indicate that long-term consumption of excess L-methionine by rats may affect primarily iron metabolism rather than the antioxidant defense system and, consequently, induce an accumulation of iron.

5. Chitosan was prepared from chitin using a deacetylation process. The molecular weight and degree of deacetylation of chitosan were determined by viscosity and infrared spectroscopy respectively. Chitosan films were grafted by 2-hydroxyethylmethacrylate (HEMA) using a ^{60}Co gamma-irradiation technique. The changes in physico-chemical properties of modified films due to graft level of HEMA onto chitosan were estimated. The tensile properties of modified films decreased on increasing graft level. The grafted films showed improved thermal stability.

6. Using selected Chinese and Australian wheats, flour protein content and composition of high-molecular-weight (HMW) glutenin sub-units were studied in relation to northern style Chinese steamed bread quality. Flour protein content had a significant impact on Chinese steamed bread quality. The

Chinese wheats were characterised by shorter Farinograph dough development time and stability in comparison with the Australian wheats. Dough stickiness in the Chinese wheat cultivars was a significant factor deteriorating Chinese steamed bread quality. A significant negative correlation was found between Farinograph stability time and steamed bread quality in Australian wheats while a significant and positive correlation existed in Chinese wheats. It would be necessary to increase the dough strength of Chinese wheat cultivars in order to improve their steamed bread making quality. Keywords: glutenin, dough, Chinese steamed bread quality.

7. There was few reports comparing the deproteinization effects between microbes and enzymes. Bustos and Michael have compared the effects of microbial and enzymatic deproteinization and found a maximum value of 82% deproteinization was achieved with *P. maltophilia* after six days of incubation. When a purified microbial protease was used, no more than 64% deproteinization was achieved under the same conditions. Microorganisms seem to be the best alternative to harsh chemical treatment for deproteinization of prawn shell waste. The authors found in a preliminary experiment that the deproteinization by enzyme (papain and bromelain) did not perform as good as with live microbes.

    To compare the deproteinization effect found in this research with other reports, we found that the differences in the analytical mothods, calculation approach, demineralization, and powderization would influence the similarity of the results; therefore, the same calculation method was used to compare the deproteinization by *P. aeruginosa* K-187 and *P. maltophilia*. SCSP, acid-treated SCSP, shrimp shell, and shrimp heads were deproteinated in the research. The SCSP was feed grade (0.4 U.S. dollars kg^{-1}) made from cooked and dried material. The shrimp shell and shrimp heads were from cooked shrimps without powderization or acid treatment.

    After five days of incubation, *P. aeruginosa* K-187 had about 82% deproteinization of shrimp shell and shrimp heads. This result was very close to the 82% (5 days incubation, *P. maltophilia*) reported by Bustos and Michael; however, only 56% deproteinization (5 days incubation, *P. maltophilia*) was found when shrimp shell was used on the substrates of this research. Even if the incubation time was increased, the maximal deproteinization could only reach around 70%. As for other reports, it is difficult to compare due to the differences stated above. From our research on direct comparison between *P. aeruginosa* and *P. maltophilia*, the result showed *P. aeruginosa* is better than *P. maltophilia*

    SCSP: shrimp and crab shell powder

8. Lysine is an essential amino acid that is widely used as a feed additive. Many animal feeds are deficient in lysine, so the lysine, as well as other amino acids, are added to these feeds to supply an adequate diet. Lysine is also used in pharmaceuticals as a diet supplement.

    Lysine is produced commercially in batch culture. Owing to the economic importance and the relatively high annual production of lysine, however, improvements in the process could be made by producing lysine in continuous culture. This paper presents the results obtained from the continuous production of extra-cellular lysine by direct fermentation by a strain of *Brevibacterium lactofermentum*. These results are compared to batch fermentation results by the same organism.

Index Entries:Lysine; *Brevibacterium lactofermentum*; continuous production; amino acids.

9. Procyanidins are a subclass of flavonoids found in commonly consumed foods that have attracted increasing attention due to their potential health benefits. However, little is known regarding their dietary intake levels because detailed quantitative information on the procyanidin profiles present in many food products is lacking. Therefore, the procyanidin content of red wine, chocolate, cranberry juice and four varieties of apples has been determined. On average, chocolate and apples contained the largest procyanidin content per serving (164.7 and 147.1 mg, respectively) compared with red wine and cranberry juice (22.0 and 31.9 mg, respectively). However, the procyanidin content varied greatly between apple samples (12.3-252.4 mg/serving) with the highest amounts on average observed for the Red Delicious (207.7 mg/serving) and Granny Smith (183.3 mg/serving) varieties and the lowest amounts in the Golden Delicious (92.5 mg/serving) varieties. The compositional data reported herein are important for the initial understanding of which foods contribute most to the dietary intake of procyanidins and may be used to compile a database necessary to infer epidemiological relationships to health and disease.

10. In addition to chitinase/lysozyme, *Pseudomonas aeruginosa* K-187 also protease useful for the deproteinization of shrimp and crab shell wastes. The optimal culture conditions for *P. aeruginosa* K-187 to attain the highest protease activity were investigated and discussed. The highest protease activity was as high as 21.2 U/ml, 10-fold that (2.2 U/ml) obtained prior to optimization. The protease of *P. aeruginosa* K-187, produced under the optimal culture conditions, was tested for crustacean waste deproteinization. The percent of protein removal for shrimp and crab shell powder (SCSP) after 7-day incubation was 72% while that of natural shrimp shell (NSS) and acid-treated SCSP was 78% and 45%, respectively. In contrast, with the protease produced under pre-optimization, conditions, the percent of protein removal for SCSP, NSS, and acid-treated SCSP was 48%, 55% and 40%, respectively. For comparison, three other protease-producing microbes were tested for crustacean waste deproteinization. However, they were shown to be less efficient in deproteinization than *P. aeruginosa* K-187. The crude protease produced by *P. aeruginosa* K-187 can be covalently immobilized on a reversibly soluble polymeric support (hydroxypropyl methycellulose acetate succinate). The immobilized enzyme was soluble above pH 5.5 but insoluble below pH 4.5. Immobilization efficiency was 82%. The immobilized enzyme was stable between pH 6 and 9 and at temperatures below 60°C. The optimum pH and temperature for the immobilized enzyme was pH 8 and 50°C. The half-life of the immobilized enzyme was 12 days, longer than that of free protease (8 days). The utilization of the immobilized enzyme for the deproteinization of SCSP has resulted in a 67% protein removal. By contrast, SCSP protein removal by using free enzyme was 72%. The protease was further purified and characterized. The purification steps included ammonium sulfate precipitation, DEAE-Sepharose CL-6B ion-exchange chromatography, and Sephacryl S-200 gel-permeation chromatography. The enzyme had a molecular weight estimated to be 58.8 kDa by using sodium dodecyl sulfate-polyacrylamide gel electrophoresis. The purified enzyme was active from pH 7 to 9 and its optimal pH was 8.