

大葉大學 九十四 學年度 研究所博士班 招生考試試題紙

系 所 別	組 別	考 試 科 目 (中文名稱)	考 試 日 期	節 次	備 註
生物產業科技學系		專業英文論文閱讀能力測驗	6月20日	第一節	第 1 頁 共 3 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）

考生注意事項

1. 筆試題目共計十題，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（不必抄題）。
3. 無適當中文翻譯之特殊專有名詞，如微生物學名、化合物、化學成分等，可依原文寫出。
4. 作答題數超過五題者，將依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。
6. 作答時請註明「選答試題之題號」，以便閱卷老師之評分。

試題

第一題

Cell walls of the fungi *Saprolegnia declina* Humphrey and *Tremella mesenterica* Fries were analyzed quantitatively. Particular attention was paid to the hydrolysis and analysis of neutral sugars, amino sugars and amino acids. These components, together with total lipids, total uronic acids and the ashed residue, accounted for more than 90% by weight of the original dry cell wall preparation. There were substantial losses of amino acids during hydrolysis; however, analytical recovery approached 100% when total protein was calculated from the total nitrogen analysis. The analytical procedures were reproducible (+/- 3% for amino acids and amino sugars, and +/- 5-10% for other components) when applied to individual cell wall preparations. However, even under carefully standardized conditions, different cell wall preparations from the same species showed variable composition. Glucose was the predominant neutral sugar in the cell wall polymers of both species. The amino acid compositions were remarkable in that neither species contained detectable levels of cyst(e)ine. Hydroxyproline was detected in both species. The report from *Tremella mesenterica* is the first for this amino acid from the cell wall of a Basidiomycete.

第二題

Prokaryotes synthesize a wide range of different polyhydroxyalkanoic acids (PHA) and accumulate these polyesters as insoluble inclusions in the cytoplasm for storage of carbon and energy. PHAs are considered for various technical applications due to interesting physical and material properties. In order to establish economically feasible biotechnological production systems and to obtain PHAs from cheap carbon sources with a preference from renewable resources, CO₂ or residual materials, efforts are undertaken to engineer novel pathways in recombinant prokaryotic and eukaryotic organisms. This requires transfer of a PHA synthase structural gene, expression of an enzymatically active PHA synthase protein and in particular engineering of pathways that provide this key enzyme of PHA synthesis with suitable substrates at sufficient concentrations. Only if all three aspects are well considered, a functional active PHA biosynthesis pathway will be expressed allowing PHA biosynthesis from central intermediates and therefore biotechnological production from renewable carbon sources or even CO₂. This review will focus on the engineering of pathways resulting in the formation of PHAs containing 3-hydroxyvaleric acid, medium-chain-length 3-hydroxyalkanoic acids or 4-hydroxybutyric acid as constituents.

第三題

This study determined the effect of high-pressure, normal temperature (25°C) storage on tilapia fillets. After pressurization, the fillets were stored at normal condition (1 atm [1 atm = 101.29 kPa] and 25°C) for 12 h to evaluate the changes of microbes and K value. The fillets stored at 2,000 atm for 12 h still kept the K value, a freshness index that presents putrefaction with the value beyond 60%, still below 40%, and the K value of the meat without pressurization was up to 92%. Total plate counts of the fillets stored at below 1,000-atm for 12 h were maintained at the value of 4.7 log CFU/g of meat, which was similar to the initial level. However, the counts were obviously decreased to about 2.0 log CFU/g of meat for the fillets stored at above 2,000 atm. The same effect was obtained for psychrophilic bacteria. Enzymes and microbes reactivated apparently after 12 h of normal condition storage of mild pressurized fillets. The study demonstrates that high-pressure storage can inhibit the putrefaction of tilapia meat but no longer after that.

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第四題

The lipases from *Thermomyces lanuginosus* (immobilized by granulation with silica) and *Candida antarctica* B (adsorbed on Lewatit, "Novozym 435") were comparatively assayed for the synthesis of sugar esters by transesterification of sugars with fatty acid vinyl esters in 2-methyl-2-butanol:dimethylsulfoxide mixtures. We found that lipase from *C. antarctica* B is particularly useful for the preparation of 6,6'-di-acylsucrose, whereas *T. lanuginosus* lipase catalyzes selectively the synthesis of 6-O-acylsucrose. The granulated *T. lanuginosus* lipase retained more than 80% of its initial activity after 20 cycles of 6h. Both lipases were similarly effective for the regioselective synthesis of 6'-O-palmitoylmaltose and 6-O-lauroylglucose. The effect of the synthesized sugar esters on the growth in liquid medium of various microorganisms (Gram-positive, Gram-negative and yeasts) was evaluated. 6-O-lauroylsucrose and 6'-O-lauroylmaltose inhibited the growth of *Bacillus* sp. at a concentration of 0.8 mg/ml, and of *Lactobacillus plantarum* at 4 mg/ml. Sucrose dilaurates and 6-O-lauroylglucose did not show antimicrobial activity, probably due to their low aqueous solubility. As regards the inhibition of yeasts, none of the tested carbohydrate esters inhibited significantly the growth of *Zygosaccharomyces rouxii* and *Pichia jadinii*.

第五題

We developed chitosan based surfactant polymers that could be used to modify the surface of existing biomaterials in order to improve their blood compatibility. These polymers consist of a chitosan backbone, PEG side chains to repel non-specific protein adsorption, and hexanal side chains to facilitate adsorption and proper orientation onto a hydrophobic substrate via hydrophobic interactions. Since chitosan is a polycationic polymer, and it is thrombogenic, the surface charge was altered to determine the role of this charge in the hemocompatibility of chitosan. Charge had a notable effect on platelet adhesion. The platelet adhesion was greatest on the positively charged surface, and decreased by almost 50% with the neutralization of this charge. A chitosan surface containing the negatively charged SO_3^- exhibited the fewest number of adherent platelets of all surfaces tested. Coagulation activation was not altered by the neutralization of the positive charge, but a marked increase of ~ 5-6 min in the plasma recalcification time (PRT) was displayed with the addition of the negatively charged species. Polyethylene (PE) surfaces were modified with the chitosan surfactant resulting in a significant improvement in blood compatibility, which correlated to the increasing PEG content within the polymer. Adsorption of the chitosan surfactants onto PE resulted in approximately an 85-96% decrease in the number of adherent platelets. The surfactant polymers also reduced surface induced coagulation activation, which was indicated by the PEG density dependant increase in PRTs. These results indicate that surface modification with our chitosan based surfactant polymers successfully improves blood compatibility. Moreover, the inclusion of either negatively charged SO_3^- groups or a high density of large water-soluble PEG side chains produces a surface that may be suitable for cardiovascular applications.

第六題

Polyhydroxyalkanoates (PHAs) are biological polyesters that are produced by a wide variety of bacteria as an intracellular storage material of carbon and energy. PHAs have recently attracted industrial attention because of their potential use as practical biodegradable and biocompatible thermoplastics. Much research has therefore been focused on the efficient production of PHAs with desirable material properties by wild-type bacteria or recombinants. Hydroxyalkanoate (HA) monomers which form PHA have been broadly divided into two classes, short-chain-length HA (scl-HA) monomers of 3 to 5 carbons, and medium-chain-length HA (mcl-HA) monomers of 6 to 14 carbons. A homopolymer of (R)-3-hydroxybutyrate, P(3HB), is a member of the scl-PHAs and is the most common type of PHA that bacteria accumulate in nature. Although the P(3HB) homopolymer triggered the commercial interest in PHA, naturally occurring P(3HB) does not have sufficient material properties for practical application. Because P(3HB) is a highly crystalline and stiff material, it is brittle and has poor elastic qualities. In contrast, mcl-PHAs are generally regarded as thermo-elastomers and rubbers. Recent advances in this area have allowed the production of a new type of copolymer consisting of scl-HA and mcl-HA units using recombinant bacteria. The copolymers are more ductile, easier to mold, and tougher in comparison with the P(3HB) homopolymer. Useful reviews on PHAs have been published by many researchers (1-4). This short review focuses on the recent progress in the microbial production of PHAs exhibiting a high performance as plastic materials, and describes their structures and material properties. In addition, molecular breeding of PHA biosynthesis enzymes and use of inexpensive renewable carbon sources for PHA production are discussed with respect to further reduction of the PHA production cost.

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第七題

Combined microwave hot air drying can greatly improve the structure and bulk volume of dried mushrooms. However, the geometry and dielectric properties of mushrooms are such that overheating of the centre hampers the application of this technology. Osmotic dehydration can be used as an effective method to remove water from vegetable tissues while simultaneously introducing solutes in the product. The residues of the solute inside the product not only influence the taste and flavour of the product, but as well the dielectric properties. In this paper halved mushrooms are osmotically pre-treated with a sodium chloride solution and subsequently dried by application of combined microwave/hot air heating. The increased salt concentration has a strong effect upon the loss factor. The results demonstrate that the mushrooms are more homogeneously heated due to the reduced centre heating, have a slightly shorter drying time, show improved rehydration properties, reduced shrinkage and a higher open-pore porosity.

第八題

Oxidative stress, resulting from an imbalance in the accumulation and removal of reactive oxygen species such as hydrogen peroxide (H_2O_2), is a challenge faced by all aerobic organisms. In plants, exposure to various abiotic and biotic stresses results in accumulation of H_2O_2 and oxidative stress. Increasing evidence indicates that H_2O_2 functions as a stress signal in plants, mediating adaptive responses to various stresses. To analyze cellular responses to H_2O_2 , we have undertaken a large-scale analysis of the Arabidopsis transcriptome during oxidative stress. Using cDNA microarray technology, we identified 175 non-redundant expressed sequence tags that are regulated by H_2O_2 . Of these, 113 are induced and 62 are repressed by H_2O_2 . A substantial proportion of these expressed sequence tags have predicted functions in cell rescue and defense processes. RNA-blot analyses of selected genes were used to verify the microarray data and extend them to demonstrate that other stresses such as wilting, UV irradiation, and elicitor challenge also induce the expression of many of these genes, both independently of, and, in some cases, via H_2O_2 .

第九題

Hydrocolloids are widely used in the food industry due to their capacity to control both the rheology and texture of aqueous systems. Hydrocolloids have also been very useful as bread improvers in breadmaking due to their antistaling effect. Nevertheless, the effect of these compounds on partially baked frozen bread has not been studied. The purpose of this work was to evaluate the effect of different hydrocolloids (κ -carrageenan and hydroxypropylmethylcellulose, HPMC) on the fresh bread quality and staling of the partially baked frozen bread. Regarding fresh bread quality, HPMC increased the specific volume and moisture retention of the bread and reduced the water activity. In addition, textural studies revealed that addition of HPMC reduced the hardness of breadcrumb and inhibited the effect of the frozen storage on the bread staling. The overall results showed that the κ -carrageenan was not a good improver for the partially baked frozen bread.

第十題

A highly active endo-type chitosanase (EC 3.2.1.132), 1 of at least 2 chitosanases secreted in the culture filtrate of *Bacillus subtilis* KH1, was purified and characterized. The enzyme was purified by 2 sequential DEAE Sepharose CL-6B chromatographies, followed by Sephacryl S-100 HR gel chromatography. The purified enzyme was found to be homogeneous by SDS-PAGE, with an estimated mol. wt. and pI of 28,000 Da and 8.3, respectively. The enzyme reduced the viscosity of highly deacetylated chitosan substrates, with the subsequent formation of chitoooligosaccharides [GlcN]_n, n = 2-6]. No activity toward carboxymethylcellulose, chitobiose or chitotriose was detected. Separation and quantification of products of hydrolysis of 10% (w/v) solutions of chitoooligosaccharides [GlcN]_n, n = 2-6 by HPLC showed the splitting of [GlcN]_n, n = 4-6, in an endo-splitting manner. Oligomers comprising higher units than the starting substrate were also detected, indicating transglycosylation activity. The amino terminal sequence of this enzyme (Ala-Gly-Leu-Asn-Lys-Asp-Gln-Lys-Arg-Arg) was found to be identical to that of the chitosanase derived from *B. pumilus* BN262, and to the deduced amino terminal sequences of *B. subtilis* 168 and *B. amyloliquefaciens* UTK chitosanases.