Application of Various Species of Lactic Acid Bacteria on The Preservation of Royal Jelly

張毓宸、徐泰浩 ; 張世揚

E-mail: 9125221@mail.dyu.edu.tw

ABSTRACT

Fresh royal jelly is a secretion from the hypopharyneal gland and mandibular gland of worker bees, and it contains 10-HDA with antibacterial activity as an important index for quality determination. Frozen royal jelly powder in low temperature can be stored for many years still maintaining the biologic property, but in stead fresh royal jelly ’ s quality is very unstable. Fresh royal jelly in storage situation is easy to be affected by temperature、light、metal、air and bacteria to result in quality deterioration. Lactic acid bacteria exists in human and animal body, and can produce metabolite(bacteriocins) for inhibition diversified bacteria. Thus it can be used for the preservation of foods extensively. This research is to evaluate by adding different lactic acid bacteria in royal jelly to prevent it from quality deterioration. In addition we adopt the base of royal jelly to culture lactic acid bacteria. First, we screen highly thermic-resisting, highly acid-resisting, highly inhibitory, and highly yield lactic acid bacteria, and then add this kind of lactic acid bacteria into royal jelly. The research focuses in building the freshness-maintaining technique of royal jelly in order to prevent it from quality deterioration. The result of the research shows that after screening there are 9 strains of highly thermic-resisting lactic acid bacteria to resist around 47°C， 3 strains of highly acid-resisting lactic acid bacteria, and 3 strains of highly inhibitory lactic acid bacteria to produce antibacterial activity against Bacillus cereus、Escherichia coli、Pseudomonas aeruginosa and Staphylococcus aureus. And there is 1 strain of highly yield lactic acid bacteria to have good performance. To culture lactic acid bacteria using the base of royal jelly, we find that the yield of L. acidophilus is better than S. thermophilus、L. lactis and L. bulgaricus. The result shows it is feasible to culture lactic acid bacteria using the base of royal jelly. Besides, it is not helpful to maintain the quality of preservation by adding the lactic acid bacteria in royal jelly in short period of time. As the temperature of storage and time increase, the color of royal jelly becomes dark gradually, the viscosity also increases, poor flow behavior was observed, and the 10- HDA also decreases.

Keywords : Lactic acid bacteria ; Royal jelly ; 10-HDA

Table of Contents

REFERENCES

參考文獻 1.方紹威。1988。乳酸菌在遺傳學上最近之發展。食品工業20（8）:42-48。 2.方繼及楊媛絢。1995。Lactococcus lactis DY11212類細菌素之生產及其特性探討。食品科學22（5）:479-493。 3.方繼及楊媛絢。1995。由Streptococcus lactis 所分泌類細菌素之初步純化及抑菌機制探討。中農化誌 33（6）:782-792。 4.方繼。1998。固定化乳酸鏈球菌素於提升食品安全之應用。食品資訊149:28-33。 5.朱文深。1994。乳酸菌之遺傳工程研究。食品工業 26(3):13-23。 5. 李錦楓。2002。蜂產品的保健功能(二)蜂王漿。健康世界187:25-26。 7.李福臨。1998。乳酸菌之保存。食品工業30(2):54-63。 8.李福臨。1989。食品加工上乳酸菌之利用。食品工業21（12）:32-38。 9.金安兒、蘇照堂及黃守潔。1993。香蕉泥的添加對嗜酸菌乳中Lactobacillus acidophilus噴霧乾燥後存活率之影響。中農化誌31（1）:68-77。 10.林美吟。1995。乳酸菌對促進人體健康的影響。中華民國營養學會雜誌 20（4）:367-380。 11.林美吟。1994。乳酸桿菌對乳糖利用之影響。嘉南學報 20:21-31。 12.洪玉梅。1995。蜂王漿在儲存過程中物化性質的變化與品質分級之評估。私立大葉工學院食品工程研究所碩士論文。1-119頁。 13.施宗雄。1994。乳酸菌的保存法。東海畜產學報2:1-4。 14.施宗雄。1992。乳酸菌之定義及對人類生活上之貢獻。東海畜產學報15:1-4。 15.徐冠裕及郭俊欽。1995。包裝及儲藏溫度對絞碎豬肉中李斯特單胞菌及乳酸菌存活之影響。東海學報36（6）:39-49。 16.徐泰浩、曾耀銘、張慈蘭。1992。蜂王漿中癸烯酸成分高效液相層析分析標準化。大葉學報1（1）:81-91。 17.張世揚。1993。蜂王漿的生產與食用方法。台灣省蠶蜂業改良場1-25頁。 18.黃加成及林慶文。1994。發酵香腸肉中乳酸菌對糖的利用性。中國畜牧會誌23（2）:209-220。 19.黃加成及林慶文。1992。乳酸菌發酵香腸肉發酵期間品質之變化。食品科學19（3）:417-425。 20.黃加成、朱賢斌及林慶文。1992。應用於中式香腸乳酸菌妩生長性狀之探討。中農化誌 30（3）:432-440。 21.黃忠村、邱致廣、李洪潮。1993。乳酸菌及酵母於芥菜汁中之混合發酵。中農化誌31（5）:673-687。 22.黃錦城。1999。 利用乳酸菌生產細菌素抑制冷藏即食食品病原菌之生長。食品工業 31（2）:27-33。 23.陳秀瑩。1994。市售蜂王漿儲存安定性及品質指標建立之研究。國立中興大學食品科學研究所碩士論文。1-123。 24.陳俊成。2000。發酵乳常用乳酸菌之生理。食品資訊171:52-59。 25.陳俊兒。1998。可食膜基質微粒被覆技術在蜂王漿保存之應用。私立大葉大學食品工程研究所碩士論文。1-102頁。 26.陳昭華。1995。蜂王漿抗生特性在其品質管制上之應用。私立大葉工學院食品工程研究所碩士論文。1-108頁。 27.陳勁初。1991。以乳酸菌保存食品之機制。食品工業23（9）:17-21。 28.陳雪娥及陳瑜芬。1992。乳酸發酵胡蘿蔔汁之製造。食品科學19（4）:476-485。 29.彭瑞森。1994。乳酸菌應用於冷藏食品腐敗之抑制。食品工業26（12）:46-52。 30.溫惠美、黃文瑛。1994。市售蜂王漿食品知品質調查。藥物食品分析2(3):225-234。 31.彭耀寰、楊重光、王惠娥、林豔貞及郭婷勻。1997。乳酸發酵之數學模式---Leudeking ’s Model之修正。中農化誌35（5）:485-494。 32.楊媛絢。1996。Lactobacillus acidophilus 之降膽固醇及抗癌性。食品工業月刊 9月:39-45。 33.詹達生。1996。酸度分析鮮蜂王漿中10- 基-α-癸烯酸。中國養蜂132（1）:17。 34.廖啟成。1998。乳酸菌之分類及應用。食品工業 30（2）:1-10。 35.廖啟成。1994。細說乳酸菌。健康世界52-61。 36.鄭穹翔。1989。蜂王乳化學成分及儲存過程中品質改變。國立台灣大學農業化學研究所碩士論文。1-88頁。 37.潘崇良、張啟華及郭鴻均。1995。乳酸菌細菌素之抑菌力及對泥鰍若干菌群之影響。中農化誌33（4）:444-458。 38.關崇智。1977。皇漿之研究。昆蟲學會會報12(1):17-24。 39.謝尤敏及蔡珊珊。1990。利用固定化乳酸菌進行蘋果酸乳酸發酵。中國農業化學會誌 28（3）:246-257。 40.戴金華及及張長泉。1994。以電導法快速測定酸酪乳中之乳酸菌數。食品科學 21（5）:407-411。 41.顏聰榮、陳建先及高炳煌。1996。乳酸菌質體DNA之研究。中國農業化學會誌 34（6）:723-731。 42.顏聰榮及李宗憲。1995。電衝在Lactococcus lactis subsp.lactis CCRC 12267基因轉移之應用。中農化誌33 (2):157-165。 43.蘇新元及林惠虹。1996。蜂王漿10- 基-2-癸烯酸紫外光簡易測定

法。食品科學 23（3）:463-467。 44.蘇和平及林慶文。1988。乳酸菌中天然抗菌物質之研究2.分泌天然抗菌物質乳酸菌培養條件及抗菌物質分離。中農化誌26（2）:197-203。 45.山本泰、東和男、掛川一、好井久雄及高雄龍宏。1991。乳酸菌在白醬油釀造之應用。食工會誌38(8):663-667。 46.加納哲、土井梅幸、橋本信宏、丹羽榮二及伊藤芳直。1992。利用乳酸菌發酵製造魚糕。食工會誌39(6):519-523。 47.園元謙二、松崎弘美及石崎文彬。1996。乳酸菌生產的抑菌素。54（7）:492-496。 48.Blum, M. S., Novak, A. F. and Taber, S. 1959. 10-hydroxy-2-decenoic acid, an antibiotic found in royal jelly. Sci. 130:452-453. 49.Blazeka, B., Suskovic, J.and Matosic, S.1991. Antimicrobial Activity of Lactobacilli and Streptococci.World J. Microbiol. Biotech.7:533-536. 50.Bloodworth, B C.,Hock,C.T. and Boon,T.O.1995.Liquid chromatographic determination of trans 10-hydroxy-2-decenoic acid content of commercial productscontaining royaljelly.Food Comp.Addi.78 (4):1019-1023. 51.Caldwell, S. L. , McMahon, D. J. , Oberg, C. J. and Broadbent, J. R. 1996. Development and characterization of lactose-positive Pediococcus species tomilk fermentation. Appl. Environ. Microbiol. 62 (3):936-941. 52.Collins, J. L. , Ebah,C. B. , Mount, J. R. , Draughon, F. A. and Demott, B. J. 1991. Proximate, nutritional and microbiological analyses of milk-sweet potato mixtures fermented with yogurt bacteria. J. Food Sci. 56 (3):682-684. 53.Cutter, C. N. and Siragusa, G. R. 1996. Reductionof listeria innocua and brochothrix therosphacta onbeef following nisin spray treatments and vacuum packaging. Food Microbiol. 13 (1):23-33. 54.Daeschel, M. A. 1989. Antimicrobial substances from lactic acid bacteria for use as food preservatives. Food Technol. Jan. :164-167. 55.Decallonne, J. , Delmee, M. , Wauthoz, P. , Lioui,M. EL and Lambert, R. 1991. A rapid procedure for the identification of lactic acid bacteria based on the gas chromatographic analysis of the cellularfatty acids. J. Food Prot.54 (3):217-224. .56.Duszkiewicz-Reinhard, W. , Khan, K. and Gujska, E. 1994. Reduction of stachyose in legume flours by lactic acid bacteria. J. Food Sci. 59 (1):115-117. 57.EL-Nezami, H. , Ahokas, J. and Salminen, S. J. 1996. Biologic control of food carcinogens with useof Lactobacillus GG. Nutri. Today 31 (6S):41-42. 58.Fernandes, C. F. and Shahani, K. M. 1990. Anticarcinogenic and immunological properties of dietary Lactobacilli. J. Food Prot. 53(8):704-710. 59.Fernandes, L. and Steele, J. L. 1993. Glutathione content of lactic acid bacteria. J. Dairy Sci. 76 (5):1233-1242. 60.Fujiwara, S., Imai, J., Fujiwara, M., Yaeshima, T.,Kawashima, T. and Kobayashi, K. 1990. A potent antibacterial protein in royal jelly. J. Biol. Chem. 265(19):11333-11337. 61.Gilliland, S. E. and Walker, D. K. 1990.Factors toconsider when selecting a culture of L. acidophilusas a dietary adjunct to produce a hypocholoesterolemic effect in humans. J. Dairy Sci. 73:905-911. 62.Gorbach, S. L. 1996. Efficacy of Lactobacillus in treatment ofacute diarrhea. Nutri. Today 31 (6):19-23. 63.Gouzalez, S. N. , Romero, N. C. , Oliver, G. , Apella, M. C.and De Macias, M. E. N. 1993. Inhibition of enteropathogensby Lactobacilli strains usedin fermented milk. J. Food Prot. 56 (9):773-776. 64.Guerrero, I. , Mendiolea, R. , Ponce, E. and Prado,A. 1995. Inoculation of lactic acid bacteria on meat surfaces as a means of decontamination in semitropical conditions. Meat Sci. 40 (3):397-411. 65.Halin, M. B. , Kalchayanand, N., Ray, P. and Ray,B. 1993.Bacterioins of lactic acid bacteria in combination have greater antibacterial activity. J. Food Prot. 56 (3):252-255. 66.Hassan, A. N. , Frank, J. F. , Farmer, M. A. , Schmidt, K. A.and Shalabi, S. I. 1995. Observation of encapsulated lactic acidbacteria using confocal scanning laser microscopy. J. Dairy Sci.78 (12):2624-2628. 67.Hove, H. , Nordgaard-Andersen, I. and Mortensen, P. B. 1994.Effect of lactic acid bacteria on the intestinal production of lactate and short-chain fatty acids, and the absorption of lactose. Am. J. Clin. Nutri. 59 (1):74-79. 68.Khedkar, J. N. , Dave, J. M. and Sannabadti, S. S1996.Preparation of bifidobacter fermented milk with and without lactic bacteria. J. Food Sci. Tech nol. 33 (1):63-65. 69.Kociubinski, G. L. , Perez, P. F. , Anon, M. C. and Antoni, G. L. DE. 1996.A method of screening for highly inhibitory lactic acid bacteria. J. Food Prot. 59 (7):739-745. 70.Ludbrook, K. A. , Russell, C. M. and Greig, R. I. 1997. Exopolysaccharide production from lactic aci d bacteria isolated from Fermented foods. J. Food Sci. 62 (3):597-600. 71.Marklinder, I. and Lonner, C. 1992. Fermentation properties of intestinal strains of Lactobacillus, of a sour dough and of a yoghurt starter culture in an oat-based nutritive solution. Food Microbiol. 9 (3):197-205. 72.McCleskey, C. S. and Melampy, R. M. 1938. Bactericidal properties of royal jelly of the honeybee. J. Econ. Entomol. 32:581-587. 73.McDonald, L. C. , Hassan, H. M. and Fleming, H. P. , et al.1991. Use of continuous culture for internal pH determination of lactic acid bacteria. Food Microbiol. 8:137-142. 74.McGregor, J. U. , Gough, R. H. , Bird, K. , Traylor, S. M. and Hazlett, S. 1995. Recovery of lactic acid bacteria on petrifilm SM under various incubation atmospheres. J. Food Prot. 57 (3):316-318. 75.Moilanen, E. , Korpela, R. , Saxelin, M. and Vapaatalo, H. 1996.Effect of Lactobacillus GG on platelet aggregation.Nutri. Today 31 (6):43S-44S. 76.Murinda, S. E. , Doores, S. and Roberts, R. F. 1995. Evaluation of lactic-acid producing bacillus and sporolactobacillus for antilisterial activity. J. Food Prot. 58 (5):570-572. 77.Nannen, N. L. and Hutkins, R. W. 1991. Intracellular pH effects in lactic acid bacteria. J. Dairy Sci.74 (3):741-746. 78.Oda, T. and Hashiba, H. 1994. Effects of skim milk and its fermented product by Lactobacillus acidophilus on plasma and liver liopid levels in diet-inducecd hypertiglyceridemic rats. J. Nutri. Sci. Vitamin. 40(6):617-621. 79.Okereke, A. and Montrille, T. J. 1991. Bacteriocininhibition ofclostridium botulinum spores by lactic acid bacteria. J. Food Prot. 54 (5):349-353. 80.Ordonez, G. O. and Jeon, I. J. 1995. Evaluation of .bata-Galactosidase activities associated with probiotic lactic acid bacteria by high performance liquid chromatography. Cultured Dairy Products J. 30(4):29-32. 81.Patidar, S. K. and Prajapati, J. B. 1997. Methods for assessingthe immunostimulating properties of dietary lactobacilli :A critical appraisal. J. Food Sci. 34 (3):181-194. 82.Sakamoto, M. and Komapata, K. 1996. Aerobic growth of andactivities of NADH oxidase and NADH Peroxidase in lactic acid bacteria. J. Ferment. Bioeng. 28 (3):210-216. 83.Salama, M. S. , Giovannoni, S. J. and Sandine, W.E. 1995. Amilk-based method for detecting antimicrobial substance produced by lactic acid bacteria. J. Dairy Sci. 78:1219-1223. 84.Salminen, S. J. and Donohue, D. C. 1996. Safety assessment of Lactobacillus strain GG . Nutri. Today 31 (6s):12-15. 85.Schaack, M. M., Marth, E. H. 1988. Survival of Listeria monocytogenes in refrigerated cultured milks and yogurt. J. Food Prot. 51(11):848-852. 86.Schiffrin, E. J. , Brassart, D. , Servin, A. L. , Rochat, F. and Donnet- Hughes, A. 1997.Immune modulation of blood leukocytes in humans by lactic acid bacteria:Criteria for strain selection. Am. J. Clin. Nutri. 66 (2):515S-520S. 87.Schiffrin, E. J. , Rochat, F. , Link-Amster, H. , Aeschlimann,J. M. and Donnet-Hughes, A. 1995. Immunomodulation of huma n blood cells following the ingestion of lactic acid bacteria. J.

Dairy Sci. 78 (3):491-497. 88.Schleifer, K. H. , Beimfohr, C. , Ludwing, W. , Ehrmann, M. , Brockman, E. and Amann, R. 1995. Application of molecular methods for the classification and identification of lactic acidbacteria. Int. Dairy J. 5 (8):1081-1094. 89.Sinha, R. P. 1991. Effect of carbohydrate on the viability of S. thermophilus. J. Food Prot. 54 (7):537-541. 90.Subramonian, B. S., Kumar, C. N. , Narasimhan, R. , Shanmugam, A. M. and Khan, M. M. 1997. Selection of level and type of " LAB " starter in the preparation of dietetic shrikhand. J.Food Sci. Technol. 34 (4):340-342. 91.Thuault, D. , Beliard, E. and Guern, J. L. et al. 1991. Inhibition of clostridium tyrobutyricum by bacteriocin-like substances produced by lactic acid bacteria. J. Dairy Sci. 74 (4):1145-1150. 92.Van den Berg, D. J. C., Pot, B., Kersters, K., Smits, A. , Ledeboer, A. M. , Verbakel, J. M. A. and Verrips, E. T. 1993. Isolation screening and identification of lactic acid bacteria from traditional food fermentation processes and culture collections. Food Biotech. 7 (3):189-205. 93.Vittek, J. Slomiany, B. L.1984. Testosterone in royal jelly.Experientia.40:104-106. 94.Yang, R. and Ray, B. 1994. Factors influencing production of bacteriocins by lactic acid bacteria. Food Microbiol. 11 (4):281-291. 95.Zommara, M. Takagi, H. , Sakono, M. , Suzuki, Y. and Imaizumi, K. 1994. Effect of milk whey and its fermentation products by lactic acid bacteria on mitochondrial lipid peroxide and hepatic injury in bile duct-ligated rats. Biosci. Biotech. Biochem. 58 (7):1213-1217.