出國報告（出國類別：國際會議）

第 59 屆國際肉品科技會

服務機關：國立中興大學 動物科學系
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派赴國家：土耳其 Izmir
出國期間：102 年 8 月 12 日 至 102 年 8 月 23 日
報告日期：102 年 11 月 11 日

摘要

國際肉品科技會議是當今各項畜產品會議中歷史最悠久且最具學術性及權威性的國際會議，每一年會議參與國家數皆在 40 個以上且參與的肉品科學家皆有 400 人以上，是世界各國有關肉品研究人員每年皆會參與的會議。目前此會議已進入第 59 屆(2013)。本屆(59)的會議是由土耳其舉辦，舉辦地點為伊慈密(Izimer)，舉辦日期是 8/18 至 8/23 日止 共計 6 天。本人與其他參與人員從台北出發至新加坡轉機至土耳其伊士坦君堡再轉機至伊慈密，8/19 早上， 先由主席 Dr Meltem Serdaroglu 搖動大會信物(搖鈴)並宣布大會正式開始，並開始大會一連串專題演講並配合壁報展出，此次共有 16 個主題，其中 8/21 由大會安排參觀土耳其規模最大的香料製造公司(Sanitan)以了解香料製造及殺菌(蟲)的過程。會議中亦與 2016 主辦國-泰國洽談未來學術合作及學生交流，收穫頗多。期望 2016 年在泰國舉辦時可讓較多有關肉品研究之學生及年輕研究者前往參與以提升國內肉品加工研究與國外交流的機會。

目次

目的-

藉著參與國際會議以了解國際各國肉品研究的方向並吸收肉品加工新知以提升國內肉品加工技術並傳授給年輕學子，而國際肉品科技會議是當今各項畜產品會議中歷史最悠久且最具學術性及權威性的國際會議，每一年會議參與國家數皆在 40 個以上且參與的肉品科學家皆有 400 人以上，是世界各國有關肉品研究人員每年皆會參與的會議。目前此會議已進入第 59 屆(2013)。本屆(59)的會議是由土耳其舉辦，舉辦地點為伊慈密(Izimer)，舉辦日期是 8/18 至 8/23 日止 共計 6 天。此次會議中不僅收集各國肉品的研究方向並且有些新觀念如添加自然來源的亞硝酸鹽及各國不同品種牛隻之改良及屠體品質的變化等， 另外，會議中亦與 2016 主辦國-泰國洽談未來學術合作及學生交流，收穫頗多。期望 2016 年在泰國舉辦時可讓較多有關肉品研究之學生及年輕研究者前往參與以提升國內肉品加工研究與國外交流的機會。

過程

8/12-17: 參訪土耳其香料產地如番紅花城以了解其紅花生產及加工等。(非公務參訪)

會議第一天(8/18)

本日行程為下午 7 點在 the Swissotel Grand Efes 大飯店舉行歡迎餐會，由大主席 Dr Meltem Serdaroglu 歡迎參加的代表與眷屬。

會議第二天(8/19)

至第 59 屆(2013)國際肉品科技會議的開會所在地 Turkey, Izmir, the Swissotel Grand Efes 報到並參加開幕儀式 由大主席 Dr Meltem Serdaroglu 宣布大會開始並報告參加國家數目、參與人數及發表專題研究篇數-總計有 49 個國家、239 個正式會員參與，若含退休人員、學生及大會演講者則總計為 420 人參與。此次會議總計有 343 篇研究論文作發表。今年大會主題為 The power of meat in 21st century，會中分為 16 個主題進行專題演講及論文壁報展示。其 16 個主題分別為 1. Novel meat sources 2. Cultural and ethnical regulations in meat industry 3. Meat sustainability 4. Animal welfare and slaughter 5. Muscle biochemistry/biology 6.Microbiology and chemical hazards in meat 7. Engineer applications in meat industry 8. Rapid methods for quality assessment 9. Advanced preservation technics for meat industry 10. Meat, nutrition and health 11. Meat processing 12. Meat and gastronomy 13. New development in meat packaging 14. Meat based functional foods 15. Hot topics 16.Theme-power of meat。此 16 個主題分別先各有 4 場專題演講後再以壁報方式進行論文報告。此次會議中本國總計有 6 位代表參加，有中興大學本人、譚發瑞副教授、嘉義大學林高塚教授 、大葉大學 陳明造教授、中華醫技大學郭秀蘭教授及碩士班學生 1 人。在第一天會議中第一場是由南非 Dr Hoffman 主講 Exotic protein sources to meet all needs。第二場為愛爾蘭 Dr Vinnarl 主講 Analyzing the structure, practices and shifts in culture that might influence the future of meat consumption. 此兩篇演講中提到肉品的消費及其來源將受當地環境、宗教、民情及習俗等影響且差距頗大。而此也是各國對肉品研究多樣化的主要原因。

會議第三天(8/20)

在第二天會議中第一場是由土耳其 Dr Hayati Koknaraglu 主講 Animal welfare: an animal science approach 。第二場為德國 Dr Jorg Hartung 主講 Stunning of pig and poultry in regard to animal welfare and meat quality. 第一位演講者強調動物生產除了重視經濟效益外應尊重動物生活空間及自由度。 而第二位演講者則提到如何在屠宰過程中讓動物處於無知覺及放鬆狀態對動物而言是動物福利要求之一且會深深影響肉品的品質，當你善待動物時動物即會回饋你好的品質，所以屠宰時讓動物昏迷方式很重要而非粗暴對待它 或採取非昏迷直接放血的方式皆非人道作法且會造成肉品品質低下。此結論也讓我深深有所感觸， 尤其早期台灣豬隻屠宰作業常會以粗暴模式對待動物，結果會發現常有異常肉質出現如水漾肉或暗乾肉。而這 20 年來經國內學者專家及政府相關單位的宣導及輔導，也逐漸讓業者有所認知並改善其屠宰條件及環境，有關異常肉質產生也變少，可見正確知識的傳授是重要的。另外由英國 Dr O’ Brine 主講的 Microbiological hazards for meat eaters: what is evidence? 中提到有關肉品安全問題尤其是微生物的危害是大家所關心的，也是目前全世界肉品消費者所要求，所以如何建立一個可生產衛生安全肉品的模式是很重要，也是全世界肉品研究者的研究主題。國內對肉品安全衛生的問題也在大家關注下啟動了 HACCP 自主預防管理制度，並且由衛福部公告進行輔導及查核以提升肉品業者對微生物造成食品危害的重視。

會議第四天(8/21)

由大會安排參訪共計有1.訪問Colakoglu肉品工廠2.參訪 牛品加工廠 3.至 Sanitan 香料公司參觀 4. 訪問 Lezita 禽肉加工廠 等四個行程， 而本人及台灣代表皆被分配參加第 3 行程，此工廠位於離會場約 3 個小時車程，因此本行程早上 7 點出發約 10:30 到達工廠，由廠長講解從原料至成品的製造過程並分批入場參觀以了解香料製造過程及如何殺菌及殺蟲等技術應用。由於此工廠的製造流程已經歐盟 HACCP 認證因此其產品大多數以銷往歐洲各國為主，其中可發現其香料原料需經產地認證後再經公司原料成分檢測後方能入場進行香料殺菌及殺蟲步驟。而其殺菌及殺蟲則以大型滅菌斧為主要處理而非放射線殺菌模式此與國內香料製造有極大差別，由於使用放射線殺菌須有特殊設施且花費昂貴，另外使用上皆須有所限制且很少可在自己場內設置，而以大型滅菌斧進行殺菌及殺蟲則可在自己場內進行，另外可依香料特性建立不同條件， 然而其主要關鍵技術則為如何讓香料在高溫及高濕條件依舊可維持其香料特性又具有殺菌殺蟲效果。其中經詢問結果為使用減壓及降低濕度以達成目的。而此項技術或許可攜回國內作為國內相關產業之參考。

會議第五天(8/22)

今天上午本人有 一篇論文在此會議中以壁報方式發表，為 Evaluation of antibacterial activity of *Toona sinensis e*xtracts using in Taiwan style sausage。 因此在演講未開始前先將貼在指定位置，再進場聽由英國 Dr Ledward 主講 High pressure processing of fresh meat.-is it worth it? 此主題中提到高壓處理是一種冷溫處理且其借由超高壓 400MP 以上處理而讓微生物無法生長以達到殺菌目的，然而不論設備投資或產能皆須再評估其經濟效益方能推廣使用。此論點確實與工廠使用者有相同的反應，亦值得國內業者作為參考。在此演講後進行壁報展示討論，美國 Dr Ohman 問到香椿植物是甚麼，為何有如此好的抑菌效果， 我回答他有關香椿是種木本植物具有特殊味道，常被亞洲人作為特殊香料之一其主要含有高量多酚物質及類黃酮，不僅抗氧化性強且抑菌效果佳，是值得推廣自然性抑菌或抗氧化物質。另外加拿大 Dr Scheeren 提到為何用在台式香腸? 我則回答台式香腸是目前台灣生產及消費量最高的肉製品。此壁報展示討論結束後接著由丹麥 DrYoung 主講 Health promoting compounds origination from meat consumption alternative aspects. 其內容主要提到如何認知肉中哪些成分是與健康相關及如何改變肉品消費習慣也就是可經由肉品不同的調理可達到美味及健康需求。由於返國航空公司的班機安排關係需今天下午離開會場由 Izmir 轉機至伊士坦君堡搭機再轉至新加坡回國，所以在下午 1:30 先行離開會場結束此次會議議程，經搭機至伊士坦君堡再轉至新加坡返回台灣。

而 2014 第 60 屆國際肉品科技會議將由南美烏拉圭(Uruguay) 主辦，而(2014)主辦國在大會開幕時亦上台歡迎大家明年南美烏拉圭(Uruguay)見。

心得及建議

此次會議亦可發現幾個產肉大國國家如澳洲、巴西、美國、德國、丹麥等參與的人數為多且出現了許多年輕的新面孔顯示三國對新進肉品科技人員的鼓勵及傳承，而此次亦發現東南亞國家如泰國、大陸 及 韓國，尤其是韓國在今年參與年輕學生有 15-18 人， 可見這些國家對肉品加工人才的重視並且培育人數已漸增多，反觀台灣我們則年輕學子出國學習此方面專業者實在太少，且已有斷層無法世代接替的隱憂，是值得政府有關研究及教育部門深入考量之處。所以建議國內應多鼓勵一些年輕學子或研究人員出國深造及多參與相關國際會議以吸收新知，將有助於國內肉品科技及產業水準的提昇。

另外經第 59 屆各國聯繫人會議決定、2021 年由日本主辦、另外其他順序 2014 由南美烏拉圭主辦、2015 由法國主辦、2016 由泰國主辦、2017 由愛爾蘭主辦、2018 由澳洲主辦、 2019 年由德國主辦及 2020 年由美國主辦。

附錄

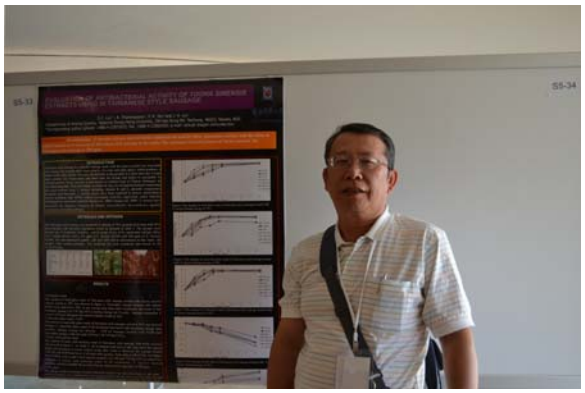
一、攜回資料名稱及內容

此次會議所帶回資料包括大會會程一冊、大會論文專輯隨身記憶卡一式與會國家及出席人員及通訊資料一冊與 2013 主辦國（土耳其）及 2014 主辦國-南美烏拉圭所公佈資料各一份。

二、活動花絮

圖一　第 59 屆國際肉品科技會議大會開幕中專題演講。

圖二　第 59 屆國際肉品科技會議(2013)台灣參與會議人員合照。



圖三　大會中本人以壁報模式發表專業論文。

三、本人所發表之論文

EVALUATION OF ANTIBACTERIAL ACTIVITY OF *TOONA SINENSIS* EXTRACTS USING IN TAIWANESE STYLE SAUSAGE

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Abstract –the utilization of extracts of *Toona sinensis* in Taiwanese style sausage to inhibit bacteria and prolong the shelf life during storage at high refrigerated temperature (15°C) was the purpose of this research. The results showed that the total plate count, anaerobic plate count, lactic acid bacteria count, mold and yeast count and VBN value of all treatments increased ($p<0.05$) with storage time, the sausage treated with 250 ppm *T. sinensis* (Te_{250}) and 125 ppm *T. sinensis* (Te_{125}) showed the lower bacteria count and VBN value during storage and the results were similar to the results of NaL. Sausages treated with NaL, Te_{125} and Te_{250} had higher pH values than that of KS during storage at 15°C. In conclusion, extracts of *Toona sinensis* possessed high total flavonoids and total phenolics contents and also showed high antibacterial ability, especially extract of *T. sinensis* with ethanol.

Key Words –total plate count, anaerobic plate count, lactic acid bacteria count, mold and yeast count and VBN value.

I. INTRODUCTION

Taiwanese style sausage is a semi-dry sausage made with the larger particle size of ground pork curing with backfat, high sugar content, rice wine and some spices, which produces a unique aroma after curing. However, the shelf life of this product is a short time due to high sugar content, low temperature and short time for drying and makes it susceptible to bacterial growth. *Toona sinensis*, is also known as Chinese toon or Chinese Mahogany in class Magnoliopsida, Meliaceae family; it widely in Asia. Several phytochemical compounds have been isolated from *T. sinensis* including vitamin B and C, phenolic compounds, flavonoids and limonoids. *T. sinensis* leaves have been reported to possess antioxidative activity including high DPPH radical scavenging activities, superoxide anion radicals, reducing power and metal chelation (Hseu *et al.*, 2008; Cheng *et al.*, 2009). *T. sinensis* leave increased the immune response in tilapia (*Oreochromis mossanbicus*) against *Aeromonas hydrophila* pathogen (Wu *et al.*, 2010). In addition, rutin from *T. sinensis* can increase resistance against *Vibrio alginolyticus* pathogen on white shrimp (Hsieh *et al.*, 2008). *Houttuynia cordata*, is also known as the fishy smell herb. It belongs to the Sauraceae family, and has been widely cultivated in Southeast Asia and in East Asia (Toda, 2005). The water extract of *H. cordata* possesses strong antioxidative activities in the reducing power and scavenging activities against DPPH radical, superoxide radical and hydroxyl radical, as well as strong herbicide power (Tian *et al.*, 2011). It can inhibit the growth of *Salmonella typhimurium* (Kim *et al.*, 2008) and mycelium and spore germination of *Fusarium oxysporum* and *Colletotrichum capsici* (Puttawong and Wongroung, 2009).

II. MATERIALS AND METHODS

Herb extracts and antibacterial agent: herb preparation- 7 g of freeze dry powder of *T. sinensis*

extract with ethanol was dissolved with 100 mL sterilized water and added into the sausage formula based on meat and fat weight. Sodium lactate (NaL)- 2.5% NaL (Sodium-L-lactate; 60% (w/w) solid contain, pH 5.3) was added into the sausage formula based on meat and fat weight, which represented as NaL treatment. Potassium sorbate (KS)- 0.1% KS was added into the sausage formula based on meat and fat weight, which represented as KS treatment. The Taiwanese style sausage was prepared by mixing of 75% ground pork ham and 25% diced backfat with non-meat ingredients based on formula in table 1. The groups were divided into 7 treatments including control group (Con), 0.1% potassium sorbate (KS), 2.5% sodium lactate (NaL), 125 ppm of 7% of *T. sinensis* (Te_{125}) and 250 ppm of of 7% of *T. sinensis* (Te_{250}). A total of 30 packs which was 180 g of sample with vacuum package was prepared for each treatment and stored at 15 ºC for 8 weeks. At week 0, 1, 2, 3, 4 and 8, three bags of each treatment were taken for analyses including microbiological quality, total volatile basic nitrogen (VBN), pH value and one bag for sensory evaluation. Data were analyzed using the ANOVA system of Statistical Analysis System's Procedures (SAS , 2002) with a 5% level of significant. Means were separated using the Duncan's new multiple range test.

Table 1 The formula of Taiwanese style sausage

	Con	NaL	KS	Te_{125}	Te_{250}
Pork ham	75	75	75	75	75
Pork backfat	25	25	25	25	25
Salt	1.6	1.6	1.6	1.6	1.6
Sugar	8	8	8	8	8
Polyphosphate	0.15	0.15	0.15	0.15	0.15
Sodium nitrite	0.015	0.015	0.015	0.015	0.015
MSG	0.8	0.8	0.8	0.8	0.8
Spices	0.35	0.35	0.35	0.35	0.35
Wine	2	2	2	2	2
NaL	-	2.5	-	-	-
KS	-	-	0.1	-	-
T. sinensis	-	-	-	0.0125	0.025

III. RESULTS AND DISCUSSION

1 Total plate count

The number of total plate count of Taiwanese style sausage treated with *Toona sinensis* extracts stored at 15°C was showed in figure 1. The total plate count (TPC) of all treatments significantly increased ($p<0.05$) with storage time. During storage at 15°C, TPC value of each treatment was significantly different ($p<0.05$), except of at week 0 the count of all treatment were around 3.51-3.87 log CFU/g. Noticeably, sausage treated with sodium lactate (NaL) had lower TPC at any storage periods than other treatments, the count of this treatment around 3.51-7.92 log CFU/g during storage at 0 weeks to 8 weeks. Sausage containing *T. sinensis* (125 and 250 ppm) also showed similar results to NaL and TPC value was 3.60-8.14 log CFU/g in Te_{125} and 3.40-8.13 log CFU/g in Te_{250} during storage. However, KS had higher TPC value at 3.79-7.96 log CFU/g,but lower than the control group (3.59-8.14 log CFU/g).

In general, sausages treated with *T. sinensis* had lower microbial counts than sausage treated with *H. cordata* in this study, was probably due to *T. sinensis* had higher contents of flavonoids and phenolics than *H. cordata*. This result was similar to the result of Liu *et al.* (2009) found *Toona sinensis* can reduce the value of the total plate count in fresh chicken sausages when treated with the dose of 500, 1000 and 1500 ppm than treating with rosemary at the same concentrations due to *T. sinensis* had higher total phenolic contents than rosemary.

In addition, sausages treated with NaL in this study showed the lowest total plate count value during storage and this result also was similar to the result of Lamkey *et al*. (1991) reported that 3% of sodium lactate can extend the lag phase in fresh pork sausage for 10 days. Lin and Lin (2002) found 3% of sodium lactate had the lowest total plate count value in low-fat Chinese-style sausage stored under refrigerator (4°C). In this study we also found that addition of potassium sorbate seemed to possess low antibacterial activity in sausages during storage and this result agreed with the result of Hsu and Sun (2006) who added 0-0.2% of potassium sorbate in Chinese style emulsified meatball after stored at 4-7°C for 7 days, potassium sorbate did not have an antimicrobial effect on total plate count and mold and yeast count.

2 Anaerobic plate count (ANP)

The analysis of anaerobic plate count of Taiwanese style sausages stored at 15°C were shown in figure 2. Anaerobic plate count of all treatments increased with increasing storage time ($p<0.05$), ANP at weeks 1, 2, 3, 4 and 8 were significantly different ($p<0.05$) between treatment. Sausages treated with NaL demonstrated effective inhibition on ANP during storage at 15°C and ANP was 3.21-6.42 log CFU/g. During storage for 8weeks, ANP of sausages treated with Te_{250} had the similar changes with NaL and ANP was 3.36-7.69 log CFU/g. During storage at weeks 3, KS also was found to have the highest ANP count (8.20 log CFU/g) and indicated low antibacterial activity on Taiwanese style sausage. On the other hand, NaL showed the best activity on against the growth of anaerobic bacteria and the results was similar to the result of Lin and Lin (2002) found that sodium lactate had the lower anaerobic count than potassium sorbate during storage for 9 weeks. Herbs extract from *T. sinensis* showed moderated on against the growth of anaerobic bacteria during storage for 3 week and the cause was to use low concentration (125-250ppm) in this study.

3 Lactic acid bacteria count

The analysis of lactic acid bacteria count of Taiwanese style sausage with herbs extracts and vacuum package were showed in figure 3. lactic acid bacteria count (LAB) for all treatments were significantly increased ($p<0.05$) with increasing storage time and significantly different ($p<0.05$) between treatment at weeks 2 during storage . At weeks 2, all treatments had LAB value lower than the control group and increased to nearly control group at after weeks 3. However, the sausage treated with NaL and Te_{250} had lower LAB than other groups. Noticeably, LAB of NaL was higher than Te_{250} at weeks 4 and weeks 8 and the number was 7.50 and 7.52 log CFU/g respectively. Analysis of Lactic acid bacteria count of all treatments , *T. sinensis* showed excellent activity to inhibit the growth of lactic acid bacteria, especially at 250 ppm had bacteria count lower than other groups.

4. pH values

The change of pH of sausages treated with herb extracts were showed in figure 4. pH value of all treatment were significantly decreased ($p<0.05$) with increase of storage time, the pH was reduced due to the growth of lactic acid bacteria in sausages. Sausage with NaL trended to keep stable pH until week 2 and then decreased, and the pH value was higher than other groups. Sausages with *T. sinensis* had higher pH values than KS. However, the sausage with all treatments had pH values higher than control group during the storage period. Moreover, the pH value of each treatment at the beginning and the end of storage were shown as control 6.44-4.42, NaL 6.49-5.25, KS 6.45-4.74, Te_{125} 6.46-4.72. Te_{250} 6.48-4.77, respectively.

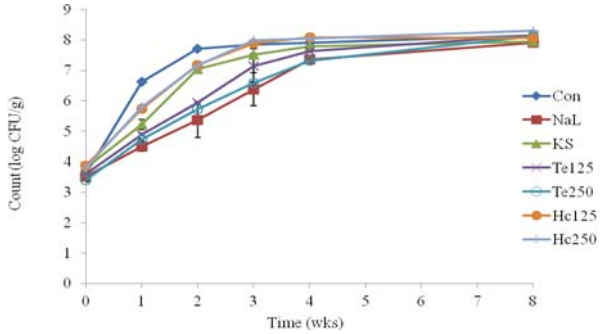

Figure 1 The changes in total plate count of Taiwanese style sausage treated with *T. sinensis* during storage at 15°C.

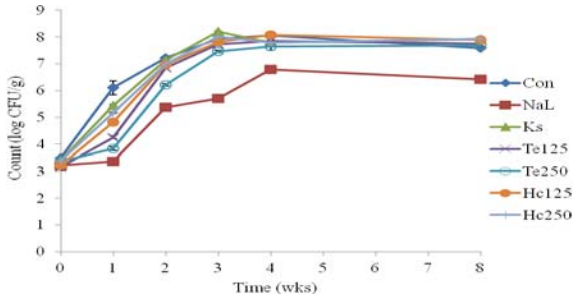

Figure 2. The changes in anaerobic plate count of Taiwanese style sausage treated with*T. sinensis* during storage at 15°C.

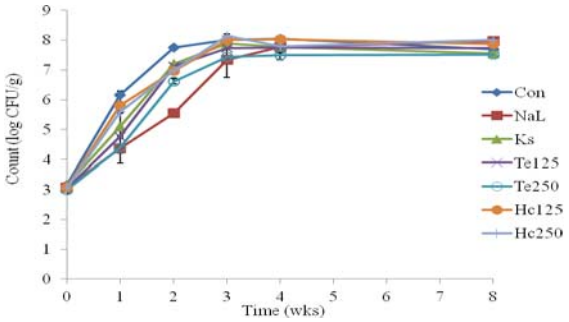

Figure3. The changes in lactic acid bacteria count of Taiwanese style sausage treated with *T. sinensis* during storage at 15°C.

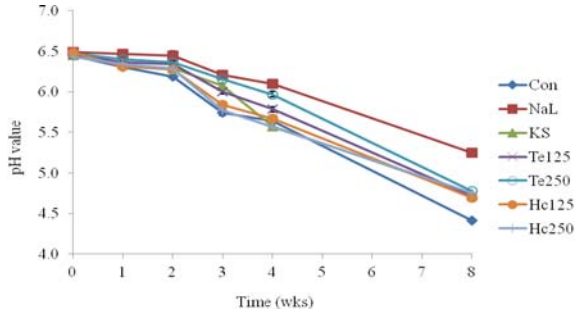

Figure4. The changes in pH value of Taiwanese style sausage treated with *T. sinensis* during storage at 15°C.

5. volatile basic nitrogen (VBN)

The increasing of volatile basic nitrogen (VBN), which is the result from decomposition of protein during storage with microorganisms, can use an index of loss of meat product freshness (Liu *et al.,* 2009). In this study, VBN values, as well as the bacterial counts, increased significantly during storage period (figure 5). In general, all treatments had lower VBN values than control group (37.11 mg%) during storage period but the values of sausage with KS had higher values than control at the ending of storage and the value was 37.75 mg%. The VBN of sausages with NaL and *T. sinensis* $_{250}$ and *T. sinensis* $_{125}$were significantly lower than the control and KS at the ending of storage and value was 30.09 mg%, 32.12 and 31.34 mg%, respectively.

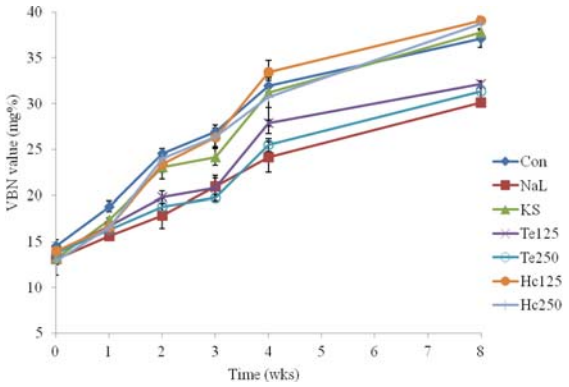

Figure5. The changes in VBN value of Taiwanese style sausage treated with *T. sinensis* during storage at 15°C.

IV. CONCLUSION

In conclusion, sausages treated with *T. sinensis* extracts showed better antibacterial activity than that of potassium sorbate and the same as sodium lactate in the study. Therefore, extracts of *T. sinensis* will be suitable to replace sodium lactate or potassium sorbate in sausage for inhibiting the growth of bacteria in the future.

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