

คุณภาพและความสามารถในการเก็บรักษาเมล็ดพันธุ์ข้าวโพดที่มีผลมาจากระยะเวลาและสภาพการเก็บรักษา

Seed Quality and Storability of Processed-Corn as Affected by Storage Condition and Time

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บทคัดย่อ

การศึกษาคูณภาพเมล็ดพันธุ์และความสามารถในการเก็บรักษาของเมล็ดพันธุ์ข้าวโพดที่มีผลมาจากสภาพการเก็บรักษาและระยะเวลา โดยแบ่งเป็น 3 การทดลอง การทดลองที่ 1 คุณภาพและความสามารถในการเก็บรักษาเมล็ดพันธุ์ข้าวโพดไร่พันธุ์ CP-001 และข้าวโพดฝักอ่อนพันธุ์ CP-002 ในสภาพการเก็บรักษาที่แตกต่างกัน 2 สภาพแวดล้อม คือ 1) อุณหภูมิ 15 °C-35%RH และ 2) อุณหภูมิห้อง พบว่า เมล็ดพันธุ์ข้าวโพดไร่และข้าวโพดฝักอ่อนที่เก็บรักษาที่ 15 °C-35%RH มีความงอก ความแข็งแรง ความงอกในไร่ สูงกว่าการเก็บรักษาในสภาพอุณหภูมิห้อง และหลังจากเก็บรักษานาน 12 เดือน ยังคงความงอก ความแข็งแรงโดยวิธีการเร่งอายุ และความงอกในไร่สูงกว่า 95, 80 และ 85 เปอร์เซ็นต์ตามลำดับ การทดลองที่ 2 คุณภาพของเมล็ดพันธุ์ข้าวโพดไร่และข้าวโพดฝักอ่อนหลังผ่านการเก็บรักษาที่ 15 °C-35%RH เป็นเวลาแตกต่างกัน 5-11 เดือน และนำออกมาเก็บรักษาที่อุณหภูมิห้อง พบว่า ความงอก และความแข็งแรงโดยวิธีการเร่งอายุลดลงเมื่อระยะเวลาการเก็บรักษาเพิ่มขึ้น ความงอกของเมล็ดพันธุ์ข้าวโพดไร่และข้าวโพดฝักอ่อนที่เก็บรักษาที่ 15 °C-35%RH เป็นเวลา 5-11 เดือนและนำออกมาเก็บรักษาในสภาพอุณหภูมิห้อง เป็นเวลา 10 เดือนยังคงมีความงอกสูงกว่า 90 เปอร์เซ็นต์ ความแข็งแรงโดยการเร่งอายุของเมล็ดพันธุ์ข้าวโพดฝักอ่อนและข้าวโพดไร่ต่ำกว่า 80 เปอร์เซ็นต์ หลังจากการเก็บรักษาในสภาพอุณหภูมิห้อง เป็นเวลา 2-4 และ 5-6 เดือนตามลำดับ ในขณะที่เมล็ดพันธุ์ที่เก็บรักษาที่ 15 °C-35%RH เป็นเวลา 8-11 เดือน ยังคงมีความแข็งแรงโดยการเร่งอายุสูงกว่า 80 เปอร์เซ็นต์ การทดลองที่ 3 คุณภาพเมล็ดพันธุ์ข้าวโพดไร่และข้าวโพดฝักอ่อนที่ผ่านการปรับปรุงสภาพเป็นเวลา 2 - 5 เดือน และเก็บรักษาที่ 15 °C-35%RH เป็นเวลา 3 - 8 เดือน พบว่า ความงอกหลังจากผ่านการปรับปรุงสภาพเป็นเวลา 2-5 เดือนยังคงสูงกว่า 90 เปอร์เซ็นต์ เมื่อเก็บรักษาเป็นเวลา 10 เดือน และความแข็งแรงโดยการเร่งอายุของเมล็ดพันธุ์ข้าวโพดฝักอ่อนและข้าวโพดไร่ลดลงต่ำกว่า 80 เปอร์เซ็นต์ เมื่อเก็บรักษาที่อุณหภูมิห้องเป็นเวลา 0-5 และ 0-3 เดือน ตามลำดับ

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ABSTRACT

Seed quality and storability of processed-corn as affected by storage condition and time were conducted consisting of 3 experiments. First, seed quality and storability of field corn cv. CP-001 and baby corn cv. CP-002 were stored under 2 storage conditions; 15 °C- 35 % RH and room temperature (RT). The result revealed that field corn and baby corn seed storage at 15°C-35%RH had higher germination, vigor as determined by accelerated aging (AA) and field emergence than those of room temperature. After 12 months storage, germination, vigor as determined by AA and field emergence of seed storage in 15°C-35% RH had still more than 95, 80 and 85%, respectively. Second, seed quality of field corn and baby corn storage at 15°C-35% RH at different storage periods for 5-11 months and then stored at RT for 10 months were determined. It was found that germination of field corn and baby corn seed storage at 15°C-35%RH for 5-11 months and then kept at RT decreased as storage period increased. After storage under 15°C-35%RH for 5-11 months, germination of field corn and baby corn had still more than 90% after storage at RT for 10 months. Vigor as determined by AA of baby corn had lower than 80% after storage at room temperature for 2-4 months. While, vigor of field corn was lower than 80% after storage at room temperature for 5-6 months whereas seed stored at 15 °C- 35 % RH for 8-11 months were higher than 80%. And third, seed quality of field corn and baby corn stored for 2-5 months after processing before storage at 15 °C- 35 % RH for 3-8 months. It was showed that germination of seed after processing for 2-5 months had still more than 90% after storage at 15 °C- 35 % RH for 10 months. Whereas, field and baby corn seed after processing for 2-5 months had vigor as determined by AA lower 80% after storage at room temperature for 0-5 months and 0-3 months, respectively.

Key word: baby corn, field corn, seed quality, seed storability

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INTRODUCTION

Hybrid corn seeds production in Thailand widely grown twice a year in rainy (April-July and August-November) and dry season (October-December and February-April). The important problem of corn seed production in rainy season was ear damaged causing by pathogens. The discarded ear in rainy season was 14-33% whereas in dry season was 4-8%. Nonetheless, seed produced in dry season provided high seed quality than those grown in rainy season due to high humidity. Therefore, it is necessary for produced seed in dry season and stored seed for 6 months before distributing for planting in the next season. After processing, corn seeds from each season were stored at room temperature or 15°C- 35%RH for 6 months of rainy season and 12 months of

dry season. The declining of seed qualities was caused by many factors such as seed history, seed moisture content, temperature and relative humidity (Bewley and Black, 1994). The seed storability does not affected by seed profile only but also depending on the storage condition. The high seed deterioration rate was occurred when seed was stored under high storage temperature and humidity. The optimum seed storage condition was under cool and dry condition. The following factors which were plant types, storage duration and physiological characteristic of seed (Elias and Copeland, 1994; Fabrizius *et al.*, 1999). Due to the seeds quality problems of each different growing seasons, thus hybrid corn seed production in dry season of each year and then storage before distribution to the market in next February. Therefore, the aim of this study was 1) to assess processed-seed quality and storability of field corn and baby corn in different storage conditions 2) to determine seed quality of field corn and baby corn after storage in controlled condition for 5-11 months and 3) to determine seed quality of field corn and baby corn after processing and stored in controlled condition for 2-5 months.

MATERIALS AND METHODS

The experiment was conducted at the Seed Laboratory, Charoen Pokphand Produce Co., Ltd. The experiment was consisted of 3 experiments. First, seed quality of field corn cv. CP-001 and baby corn cv. CP-002 in different storage conditions were conducted. The experiment was arranged by split plot design with 4 replications. Two storage conditions consisted of 15°C- 35%RH and room temperature as main plot. Twelve storage periods were 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22 and 24 months as sub plot. Second, seed quality of field and baby corn under storage at 15°C- 35%RH at different storage periods for 5-11 months and stored at room temperature for 10 months were determined. The experiment was arranged as split plot design with 4 replications. Main plot consisted of seven storage periods at 15°C- 35%RH at 5, 6, 7, 8, 9, 10 and 11 months after storage. Six storage periods were 2, 4, 6, 8, 10 and 12 months after stored at 15°C-35%RH as sub plot. And third, seed quality of field corn and baby corn were stored for 2-5 months after processing before storage at 15°C- 35%RH for 3-8 months were conducted. Split-split plot design was arranged with 4 replications in this experiment. Four storage periods after processing were 2, 3, 4 and 5 months before storage at 15°C- 35%RH as main plot. Six storage periods at 15 °C- 35 % RH were 3, 4, 5, 6, 7 and 8 months as sub plot. Six storage periods after stored at 15 °C- 35 % RH were 2, 4, 6, 8, 10 and 12 months as sub-sub plot. Seed moisture content, germination, vigor as determined by accelerated aging (AA) and field emergence were determined every 2 months.

RESULTS

I. Seed quality and storability of corn as affected by storage time and conditions

Seed quality of field corn cv. CP – 001 and baby corn cv. CP – 002 were stored under 2 storage conditions between room temperature and 15°C-35%RH. The result showed that Moisture content of field corn and baby corn seed under room temperature were higher than stored at 15°C-35%RH. Whereas, seed germination, vigor as determined by AA and field emergence of field corn and baby corn seed stored at 15°C-35%RH were higher than those room temperature. After 12 months of storage, germination, vigor as determined by AA and field emergence of field corn and baby corn seed stored at 15°C-35%RH had higher than 95, 80 and 85%, respectively. Under room temperature, seed germination decreased less than 90% after storage for 10 and 8 months, vigor as determined by AA had less than 80% after storage for 6 and 4 month, and field emergence of field corn and baby corn was less than 85% after storage for 12, 10 months, respectively (Figure 1 and 2).

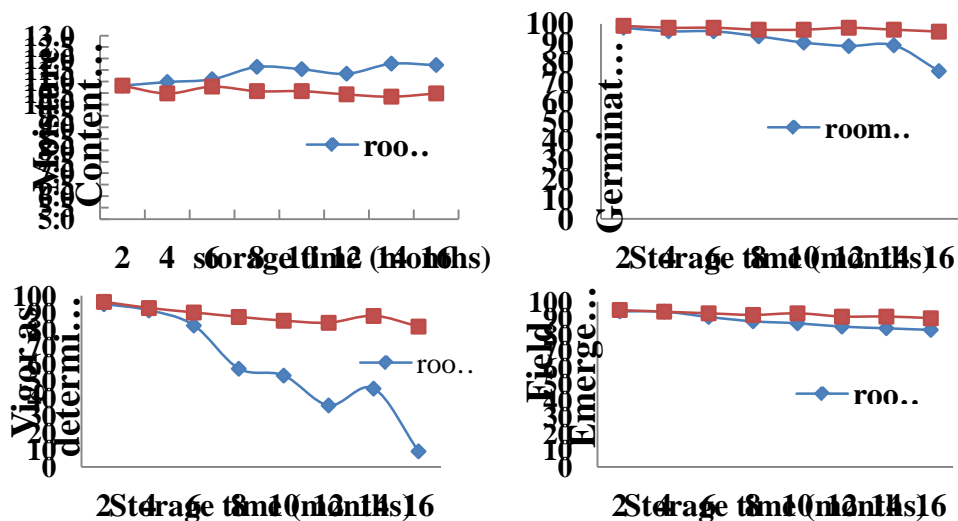


Figure 1 Changes in moisture content, germination, vigor as determined by AA and field emergence of field corn cv. CP-001 as stored under 15 °C- 35% RH and room temperature

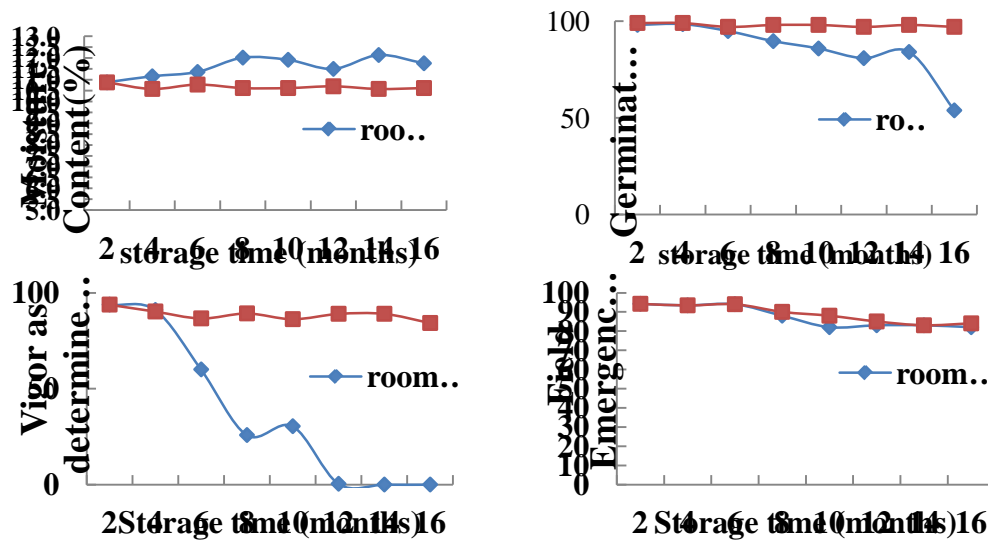


Figure 2 Changes in moisture content, germination, vigor as determined by AA and field emergence of field corn cv. CP-002 as stored under 15 °C- 35% RH and room temperature

II. Seed quality of field corn and baby corn stored alternated between 15 °C- 35 % RH and room temperature

Seed germination and vigor as determined by AA of filed and baby corn seed after stored at 15°C-35%RH for 5-11 months and then stored at room temperature were decreased as storage time increased. After storage at 15°C- 35%RH for 5-11 months, germination of field corn and baby corn had more than 90% after storage at room temperature for 10 months. Vigor as determined by AA of baby corn seed was lower than 80% after stored at room temperature for 2-4 months. While, vigor as determined by AA of field corn seed after stored under 15°C-35%RH for 5-7 months and then stored at room temperature for 5-6 months had lower than 80 % (Figure 3 and 4).

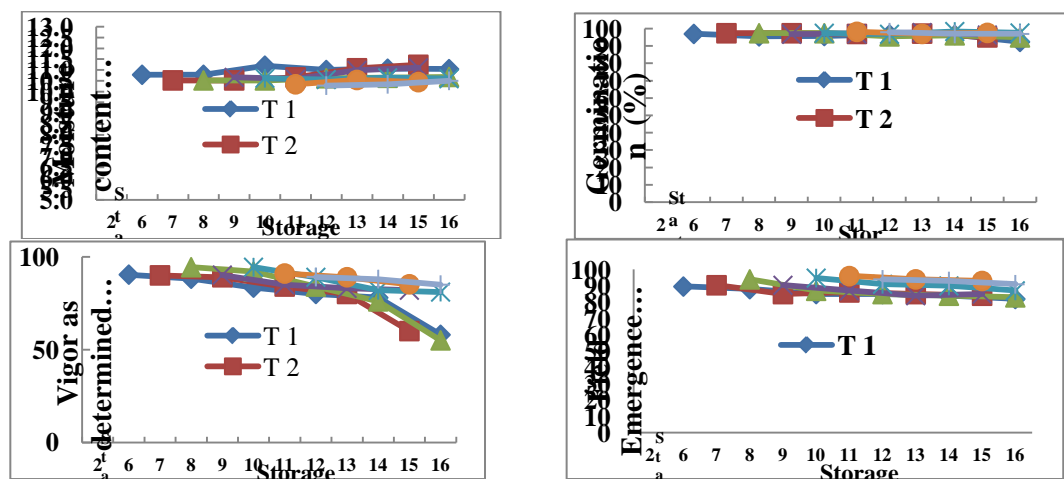


Figure 3 Changes in moisture content, germination, vigor as determined by AA and field emergence percentage of field corn cv. CP-001 after storage at 15 °C – 35 %RH for 5-11months (T1, T2, T3, T4, T5, T6 and T7 = after storage 15°C-35%RH for 5, 6, 7, 8, 9, 10 and 11 months)

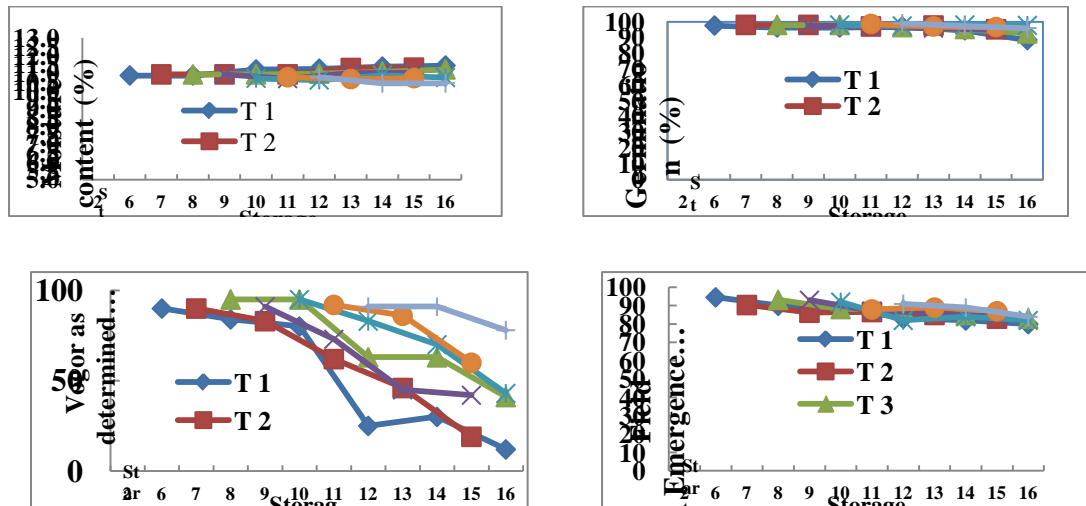


Figure 4 Changes in moisture content, germination, vigor as determined by AA and field emergence of baby corn cv.CP-002 after storage at 15 °C– 35 %RH for 5-11 months (T1, T2, T3, T4, T5, T6 and T7 = after storage 15°C-35%RH for 5, 6, 7, 8, 9, 10 and 11 months)

III. Seed quality of field corn and baby corn in different processing times before storage at 15°C-35%RH

Seed germination of field corn after processing for 2-5 months and then stored at 15°C-35%RH for 10 months had more than 90%. While, baby corn seed after processing for 2 months showed germination lower than 90% after stored at 15°C- 35%RH for 10 months. Seed vigor as determined by AA of field corn or baby corn after processing for 2-5 months before storage and then stored under 15°C-35%RH for 3-8 months was more than 80%. Whereas, field and baby corn seed after processing for 2-5 months had vigor as determined by AA lower than 80% after stored at room temperature for 0-5 months and 0-3 months, respectively (Figure 5 and 6).

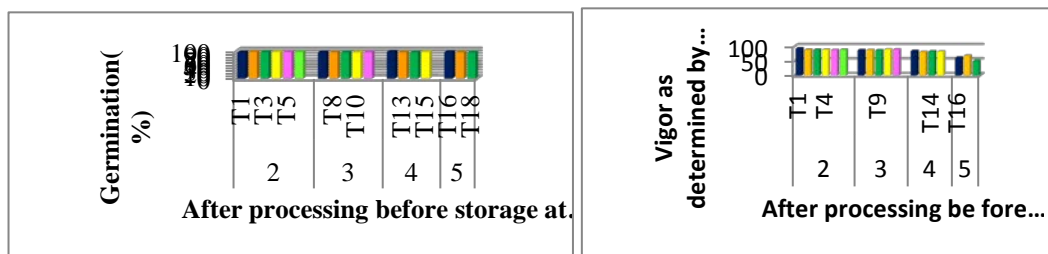


Figure 5 Germination and vigor as determined by AA of field corn cv. CP-001 after stored under 15°C- 35%RH for 3-8 months

T1,T7,T12,T16 storage at 15°C- 35%RH for 3 months
 T3,T9,T14,T18 storage at 15°C- 35%RH for 5 months
 T5,T11 storage at 15°C- 35%RH for 7 months.

T2,T8,T13,T17 storage at 15°C- 35%RH for 4 months
 T4,T10,T15 storage at 15°C- 35%RH for 6 months
 T6 storage at 15°C- 35%RH for 8 months.



Figure 6 Germination and vigor as determined by AA of baby corn cv. CP-002 after stored under 15°C- 35%RH for 3-8 months

T1,T7,T12,T16 storage at 15°C- 35%RH for 3 months

T2,T8,T13,T17 storage at 15°C- 35%RH for 4 months

T3,T9,T14,T18 storage at 15°C- 35%RH for 5 months

T4,T10,T15 storage at 15°C- 35%RH for 6 months

T5,T11 storage at 15°C- 35%RH for 7 months.

T6 storage at 15°C- 35%RH for 8 months.

DISCUSSIONS

Field and baby corn seed storage under different storage conditions and durations increased as storage period increased. According to Ngamprasitthi *et al.* (2007) reported that corn seed storage in cold room and room temperature for 12 months had significant differences in germination and vigor when storage time increased. Seed stored under cold room were provided low seed deterioration than those at room temperature condition. Furthermore, Tang *et al.*(1999) found that the rate of deterioration was greatly influenced by storage environment and increased with increasing storage temperature, seed moisture, or both. The assumption of a constant rate of seed deterioration in identical storage environments was valid for hybrid corn seed. Similar to the result from Harrington (1972), Delouche *et al.* (1973), Lovato and Balboni (1997) reported that germination and vigor of filed corn and baby corn were decreased as storage period increased. Germination was not difference and vigor as determined by AA decreased after processing storage in cold room for 2-5 months. Seed saving storage may not were the best of seed germination and vigor as determined by AA only maintain seed quality or slow the seed deterioration (Delouche *et al.*, 1973)

CONCLUSIONS

Seed quality of field and baby corn seed stored under 15°C- 35%RH had higher in germination, vigor as determined by AA and field emergence than those of room temperature after 12 months of storage. After storage in 15 °C- 35 % RH for 5-11 months, germination of field corn and baby corn had still more than 90% after storage at room temperature for 10 months. Vigor as determined by AA of baby corn had lower than 80% after stored at room temperature for 2-4 months. While, vigor of field corn was lower than 80% after storage at room temperature for 5-6 months whereas seed stored at 15 °C- 35 % RH for 8-11 months were higher than 80%.

Germination of seed after processing for 2-5 months had still more than 90% after storage at 15 °C-35 % RH for 10 months. Whereas, field and baby corn seed after processing for 2-5 months had vigor as determined by AA lower 80% after storage at room temperature for 0-5 months and 0-3 months, respectively.

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