تأثير كل من مواعيد قطع الري وطرق قتل المجموع الخضري والعلاج التجفيفي في مكونات الحاصل ونوعيته وفي القابلية الخز نية لدرنات البطاطا *Solanum tuberosum* L.

أطروحة
مقدمة إلى مجلس كلية الزراعة في جامعة بغداد
وهي جزء من متطلبات درجة دكتوراه فلسفة
في البستنة

من قبل
صبيح عبد الوهاب عنجل الحمداني

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بسم الله الرحمن الرحيم

إقرار المشرف

اشهد بان إعداد هذه الاطرحة جرى تحت إشرافي في قسم البستنة / كلية الزراعة / جامعة بغداد وهي جزء من متطلبات درجة دكتوراه فلسفة في العلوم الزراعية – البستنة (إنتاج وخزن محاصيل الخضر).

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Influence of irrigation terminating times, vines desiccation methods and curing on quantitative and storability of potato tubers *solanum tuberosum* L.

A Dissertation

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By
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بسم الله الرحمن الرحيم
الم تر إن الله انزل من
السماء ماء فتصبح
الأرض مخضرة إن الله
لطيف خبير
صدق الله
العظيم
سورة
الحج الاية
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Abstract

A study was conducted during the spring seasons of 2001 and 2002 years. In each season two experiment were conducted the first one was a field experiment while the second was storage experiment, both were done on potato tubers (*Solanum tuberosum* L.) Desiree cv. (class. A). Potato seeds were planted on Jan. 16 and 17 for the two seasons respectively .

The experiment included 21 treatments resulted from three times of terminating irrigation which they were before 12, 8 and 4 days from the date of lifting tubers beside seven vines desiccation methods: 8 days by hand, 8 days by gramoxone, 4 days by hand, 4 days by gramoxone, 2 days by hand, 2 days by gramoxone and by hand directly before tubers lifting as (control). The treatments were distributed in a factorial experiment with three replicates in Randomized Complete Block Design (R.C.B.D). Means were compared according to L.S.D. test with 5% significant level.

Quantitative and qualitative characteristics were recorded after lifting tubers. Potato tubers then prepared to storage experiment in which each of the field replicate of the 21 treatments was divided into two groups. Tubers of the first group was stored directly (with out curing) in a cold storage at 4 ± 1^{0}C and 85 ± 5% RH, while tubers of the second group were cured with 10 - 15 ^{0}C and 80 - 85% RH for 15 days, after that tubers of the two groups were together transferred with a cold storage (4 ± 1^{0}C) for three months period. All tubers then exposed to a temperature of 30 – 35 ^{0}C and 44 – 53% RH for 10 days for reconditioning purpose which represent the marketing period. So that this experiment includes 42 treatments. Same statistical design was used with this experiment. Results could be summarized as follows:-

1-The Field Experiment:

No significant effects of the times of terminating irrigation was detected on each of the:- number of tubers / plant, individual plants yield, marketable yield, total yield for both seasons, in addition to the percentages of dry matter, carbohydrate, starch, protein and the specific gravity in the first season, where as terminating irrigation 8 days before

lifting potato tubers significantly reduced the percentage of skinning tubers to 54.76%. However, terminating irrigation 4 days before tuber lifting significantly increased this percentage to 66.07% for the first season.

Ceasing irrigation 12 days before lifting tubers significantly increased the percentages of each of : dry matter to 16.44%, carbohydrate to 11.78%, starch to 10.65%, specific gravity to 1.064 gr/cm^3 beside it increased the thickness of the corky cell layer to 59.52µ. However, ceasing irrigation 4 days before lifting time significantly decreased the dry matter to 15.74%, carbohydrate to 11.00%, starch to 10.03% and specific gravity to 1.061gr/cm^3, in a comparison of terminating irrigation before 8 days where the thickness of the corky cell layer was declined to 51.86µ, but ceasing irrigation 4 days before lifting time significantly increased the percent of protein to 2.03% , where as ceasing irrigation 12 days before potatoes lifting significantly reduced this percentage to 1.74% in the second season.

As far as vines desiccation is concerned the results indicated that hand cutting 4 days before tubers lifting caused a significant increased in the average number of tubers/plant to 10.43, plant yield to 0.66 kg/plant, marketable yield to 7.58 ton/donum and the total yield to 8.28 ton/donum in a comparison with the gramoxone desiccation before 8 days of tuber lifting which resulted in a significant decreased in the number of tubers/plant to 8.20, plant yield to 0.50 kg/plant, marketable yield to 5.74 ton/donum and the total yield to 6.25 ton/donum.

The results also indicated that using gramoxone 2 days before tubers lifting significantly increased the percentage of dry matter to 20.78%, carbohydrate to 15.23%, starch to 14.52%, specific gravity to 1.084 gm/cm^3 and protein to 2.19%. However, the hand cutting method before 8 days of tubers lifting, significantly reduced the percentage of dry matter to 17.53%, carbohydrate to 12.38%, starch to 11.62%, and specific gravity to 1.069 gm/cm^3, where as the hand cutting of vines directly before lifting significantly decreased the protein to 1.63% in the first season.

In the second season, the hand cutting method of vines directly before lifting time significantly increased the plant yield to 1.25 kg/plant, marketable yield to 14.77 ton/donum and total yield to 15.62 ton/donum. In the contrast, the gramoxone killing method of vine before 4 days of tubers lifting significantly reduced the plant yield to 1.05 km/plant, marketable yield to 11.93 ton/donum and total yield to 13.17 ton/donum. It is important to say that the vines cutting by hand 8 days before tubers lifting time, significantly decreased the percentage of skinning tubers to 29.96% as compared with the hand vine cutting 2 days before lifting time which was significantly increased this percentage to 53.25%.

The results also showed that the hand cutting method of vines just directly before tubers lifting, significantly increased dry matter to 17.21%, carbohydrate to 12.47%, starch to 11.34%, and the specific gravity to 1.068 gm/cm^3, but the desiccation with gramoxone procedure 2 days before lifting time significantly decreased the dry matter to 15.01%, carbohydrate to 10.46%, starch to 9.38%, and specific gravity to 1.058 gm/cm^3, in addition to that, the gramoxone desiccation method 2 days before lifting time significantly increased protein content to 1.94% when we compared it with the hand cutting method directly and before 8 days of tubers lifting in which the percentage was reduced to 1.78%. The hand cutting method 8 days before lifting time caused a significant increased in the thickness of the tubers corky cell layer 62.44µ as compared with those tubers in which vines were cut by hand just directly before potatoes lifting time in which layer thickness declined to 47.56µ.

2- The Storage Experiment:

The results of this part of work showed that the terminating of irrigation times had a significant effect on the most studied characteristics. Ceased irrigation 4 days before tubers lifting time caused a significant increased in each of the percentage of cured tubers to 48.10% and sprouting induction to 42.67% ,while ceasing irrigation 12 days before tubers lifting significantly reduced the percentage of cured tubers to 41.93%, where as terminating irrigation 8 days before lifting highly reduced the sprouting induction to 27.84% after three months of storage in the first season.

In addition to that, we have found that terminating irrigation 12 days before lifting time significantly reduced tubers weight loss to 7.36% and 5.06%, when we compared it with the treatment in which irrigation was terminated 4 days before tubers lifting when weight loss significantly increased to 8.56 and 5.65% for the two seasons respectively. In the other side, ceased irrigation 8 days before tubers lifting significantly increased the dry matter to 19.13 and 17.19%, carbohydrate to 13.78 and 12.22%, starch to 13.05 and 11.32% and the specific gravity to 1.076 and 1.068 gm/cm^3 for both seasons respectively. However, terminating irrigation before 12 days in the first season and 4 days before tubers lifting time in the second season highly reduced dry matter to18.59 and 16.57%, carbohydrate to 13.45 and 11.83%, starch to 12.57 and 10.77% and specific gravity to 1.074 and 1.065gm/cm^3 for the both seasons respectively.

Terminating irrigation 8 days before lifting time increased protein percentage to 1.88% in the first season, where as terminating irrigation 12 days before lifting time highly increased protein percentage to 2.00% for the second season as compared with the terminating irrigation before 12

days of lifting time in which the protein percentage reduced to 1.75% in the first season. However , in the second season the treatment in which irrigation was ceased 8 days before tubers lifting time decreased protein percentage to 1.91%. There was an obvious effect of the two treatments in which irrigation was ceased 12 and 8 days before tubers lifting time that caused the highest increased in the thickness of the corky cell layer to 49.14µ as compared with tubers that irrigation terminated 4 days before lifting time in which tubers thickness was declined to 44.81µ in the second season.

The results also indicated that vines killing methods has a tremendous effect on the studied characteristics at the end of the storage period. Both of gramoxone desiccation, 4 days before lifting time in the first season and the hand cutting methods 8 days before lifting tubers in the second season caused a significant increased in the percentage of cured tubers to 48.86 and 59.29% respectively, as compared with the directly hand cutting method before tubers lifting in which the percentage was reduced to 387.03 and 34.94% for both seasons respectively.

The vines hand cutting directly before tubers lifting in the first season and the vines hand cutting 8 days before lifting time in the second season caused a significant increased in the sprouting induction percentage to 39.74 and 93.76% respectively, while, defoliation with gramoxone methods 4 days before lifting time significantly decreased this percent to 28.04 and 88.55% for the two seasons respectively.

In the other hand, vines hand cutting 8 days before tubers lifting time, significantly decreased the percentage of weight loss to 4.90% in the second season as compared with the same method but before 2 days of lifting time in which this percentage was increased to 5.73% The vines hand cutting method before 8 days of lifting time significantly reduced decay percentage to 7.94 and 3.75%, where as the hand cutting of vines directly before tubers lifting resulted in a significant increased in this percentage to 11.84 and 9.39% for both seasons respectively.

Vines desiccation with gramoxone method 2 days before lifting time in the first season and hand cutting of vines directly before lifting time in the second season caused a significant increased in the dry matter percentage to 19.55 and 18.77%, carbohydrate to 14.24 and 13.65%, starch to 13.42 and 12.73% and specific gravity to 1.078 and 1.075 gm/cm^3 for the two seasons respectively. However, vines hand cutting 2 days before lifting time in the first season and the same method 8 days before lifting time in the second season significantly reduced the percentages of dry matter to 17.68 and 15.87%, carbohydrate to 12.69 and 11.16%, starch to 11.76 and 10.15% and the specific gravity to 1.070 and 1.062 gm/cm^3 for the two seasons respectively. Desiccation of vines with gramoxone 4 days before tubers lifting in the first season and the

same method but before 8 days of tubers lifting in the second season significantly increased the percentage of protein to 1.91 and 2.01% respectively, where as vines desiccation with gramoxone method 8 days before tubers lifting in the first season and the same method but 2 days of tubers lifting time for the second season significantly reduced the percentages to 1.72 and 1.87% respectively. Vines hand cutting 2 days before tubers lifting time increased corky cell layer thickness to 49.78µ as compared with tubers their vines were cut 8 days before lifting in which layer thickness significantly reduced to 46.22µ at the end of storage time in the second season.

Curing potato tubers significantly increased sprouting induction to 65.41 and 96.46% in a comparison with non cured tubers in which the sprouting induction percentage was decreased to 0.39 and 85.58% for the two seasons respectively at the end of storage period. Curring method also significantly reduced weight loss percentage to 6.93% while this percentage was increased in the uncured tubers to 8.76% for the first season. However, uncured tubers method significantly reduced tubers decay to 5.81%, while decay percentage was increased to 13.23% when tubers were cured in the first season.

Uncured treatment significantly increased each of dry matter to 19.34 and 17.15%, carbohydrate to 13.95 and 12.26%, starch to 13.24 and 11.29%, specific gravity to 1.077 and 1.067 gm/cm^3 and protein to 1.96 and 2.00% when we compared it with the cured tubers in which the percentage was declined for each of dry matter to 18.38 and 16.67%, carbohydrate to 13.27 and 11.81%, starch to 12.38 and 10.86%, specific gravity to 1.073 and 1.065 gm/cm^3 and protein to 1.69 and 1.92% for both seasons respectively.

The results also indicated that curing method significantly increased the thickness of corky cell layer to 54.44µ. However, non-curing method of tubers significantly reduced the thickness of this layer to 51.71µ in the second season.