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## Response of Mung bean (Vigna radiataL) for several concentration of Colchicine (Colchicum autominal) for inducing Autotetraploid plants



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#### ARTICLE INFO

Received: 6 / 5 /2012 Accepted: 9 / 6 /2013 Available online: 19/7/2022 DOI:

#### Keywords:

(Vigna radiataL), Colchicine (Colchicum autominal), Autotetraploid plants.

#### ABSTRACT

A study was conducted in the nursery of the field crop department/College of Agriculture/ University of Salahaddin 2008-2009 to demonstrate the effects of Colchicine aqueous solution on Mung bean seeds by two different concentration (0.1 & 0.2) % and two different treating periods (12&24) hours plus the control. We found that the treating with (0.1%&12h) gave us the best results for inducing tetraploiede plants which is characterized by increasing leaf area, stem diameter, number of branches, weight of the pods, seed weight and fresh weight and decreasing in the plant height and dry weight In comparing between Diploid & Tetraploiede plants according to paired t-test under the level of 0.01 we found highly significant differences Between the means of all characters except the number of branches & dry weight.

#### Introduction

Mung bean (Vigna radiate L.) is one of the most common Agronomy crops grown annually for it's mature crops in Kurdistan. There are many cytological studies in crossing between Green gram &Black gram (Mat lob et al 1989).The commercially grown cultivated varieties Mung bean are diploid, and their somatic chromosome number is (22) (Alias & Mahfoth 1985).

The induction of polyploidy in plants is considered as one of the method used in plant breeding and improvement (Allard, 1960) and there are many attempts by various researchers for inducing Autotetraploid in different plant species (e.g. pepper Al-Beatty, 1985) Trifolum (Muhammad, 1985) Muskmelon (Perry et al 1989), annual medics (AL-Leila et al, 1993), Watermelon AL-Kumar, (1993) ]. it has been found that the best method for obtaining autotetraploid plants, is by using various concentration of aqueous solution of Colchicine. The effect of colchicines is on dividing cells during mitosis, colchicines interferes with spindle fibers formation and does not have effect on chromosome replication mechanism (Welsh1981) (Sharma Sharma 1982).The chromosome number will be doubled, so the cells are containing tetraploiede chromosome instead of diploid as a result of the effect of Colchicine. The resulting autotetraploid plants are characterized by producing larger pods with few seeds in them (Perry et al., 1989).

#### **Materials and Methods**

This experiment was carried out in the nursery of the filed crop department /collage of Agriculture/ University of Salahaddin 2008- 2009Mung bean seeds were socked in two concentrations (0.1&0.2) % of aqueous solution of Colchicine, with two periods of time (12&24) hours. The same number of seeds were treated with distilled water as a control treatment. After

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completing the treatments the seeds were washed with running tap water for overnight to remove the possible poisonous effect of Colchicine. The same number of seeds were treated with distilled water as a control treatment (picture 1). The seeds were planted in (G.V) Pots (picture2) after germination of the seeds the percentage of germinated seeds were calculated then transfered of seedling done to the nursery (picture3) after that the percentage of living plants were taken. 20 plants were choose randomly and they labeled to studding the characters which are Leaf area, Stem diameter, Number of branches, Plant height, Green weight, Pods length, Pods weight. All the data were statistically analyzed paired (t) test were used for comparisons the differences between the means.

#### **Result and Discussion**

Figure (1) shows the percentage of germinating seeds which decreased as colchicines concentration increased also the percentage of living seedlings were decreased as colchicines concentration increased (figure 2).There are significant differences between the means of the characters as compared with the control. This may be due to the treatment with colchicines effects on period and activity of mitotic divisions. Which interferes with spindle fibers formation, Welsh (1981). This is the same result of Al-Leila (1993) in the effect of Colchicin in annual medics. Table (1) shows the overall vegetative comparison between diploid and tetraploiede plants. The same results were found in soy bean (Bias & Bhattacharya, 1974) & annual medics (Al-Leila et al., 1993).Leaf area &vegetative growth diameters were significantly increased in tetraploiede plants (picture 1&2) after comparing diploid plant with tetraploiede plants Our result is agree with result of Muhammad (1985) in inducing polyploidy plants in Trifolum alexandrinume. This is clearly indicates the effect of colchicines by having a gigantism effect on dividing cells causing the cell to be larger in size of treated tissue (Allard el 1960) (Welsh, 1981) Perry et al (1989) found the same result in muskmelon. The same results were found in the other characters like the number of branches, stem diameter decreasing in plant height this is the indicator for the effect of colchicines on the increasing the cell size then increasing the plant parts, Table (2) shows the Pod and yield characters we observed highly significant differences between diploid & tetraploiede plants in the pod length (picture 3) pod weight which increased with highly significant differences, also the seed weight increased in tetraploiede plants significantly, this is due to the effect of Colchicine on chromosome doubling mechanism during cell division, after meiosis the pollen grains will contain the diploid number instead of haploid chromosome number (Welsh, 1981). The green weight of pods increased highly significantly in tetraploiede plants compared with diploid plants (picture 3), this due to the effect of colchicines on increasing the cell size then increasing the cell tissue, our result agree with Muhammad (1985) result in Trifolum decreasing of pods dry weight observed with highly significant differences between tetraploiede and diploid plants, same result founded from Muhammad (1985), this due to the water contain of tetraploiede plants is very high as compared with diploid plants for their the loss water from tetra plans were more than the loss of water from diploid plans.

P-ISSN 1991-8941 E-ISSN 2706-6703 2013,(7), (3):32-36







Figure (2) The percentage of living plants after germination of treated seeds with two different concentration of colchicines.

Table (1) Comparison between diploid and tetraploiede plants
for the vegetative studied characters.

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Characters	Diploid plants (2n) Chromosome	Tetraploiede plants (4n) Chromosome	The range between the means (2n-4n)
Leaf area (cm2) **	13.4	23.5	13.82-5.4
Number of the branches/ plant	3.9	5	2-2
Steam diameters (mm) **	0.47	0.97	0.8-0.9
Plant height (cm) **	24.5	20.1	12.2-10.9

\*\* High significant different under the level of 1%.

for the yield studied characters				
Characters	Diploid plants (2n) Chromosome	Tetraploiede plants (4n) Chromosome	The range between the means (2n-4n)	
Pod length (cm) **	4.12	5.7	2-2	
Pod weight (gm)**	0.17	0.27	0.21-0.23	
Seed weight (g)	0.024	0.036	0.03-0.01	
Fresh weight (g) **	4.29	5.1	1.7-2.4	
Dray weight	1.17	1.07	1-0.8	

Table (2) Comparison between diploid and tetraploiede plants

\*\* High significant different under the level of 1%.



Picture (1) A) Tetraploiede leaves, B) Diploid leaves= Control treatment.

A –Tetraploiede pods B- Diploid pods



Picture (2) A) Tetraploiede pods, B) Diploid pods.

P-ISSN 1991-8941 E-ISSN 2706-6703 2013,(7), (3):32-36



Picture (3) The vegetative yield in (A) diploid and (B) tetraploiede plants

### References

- AL-Beatty, M. H. (1985) Studies on polyploidy pepper. M. Sc. Thesis. Collage of Agr. UNIV. Bagdad, Iraq.
- Allard, R. W. (1960). Principles of plant breeding. John Wiley and Son sic. N. Y.
- AL –Leila, M. j., A. A. H. Mohammad and A. K. Al-Fakery. (1993). Effect of colchicines in annual medic/Me sop. j. Agric. 25 (2) : 121 129 (in Arabic).

- Al. kummel, M. K, (1993) Induction of autotetraploid Watermelon. Dep. of Horticulture, Collage of Agriculture &Forestry, Mosel University.
- 5. Alias &Mahfoth (1985) Fundamentals of Field crops And Horticultural Breeding.
- Bissau, A. K. &Bhattacharya, N. K. (1974) Induced polyploidy in legumes. Phaseolus vulgar is l. Cytology, 41: 105-110.
- Mat lob, A. N. Press., E., Sultan and K. SAbdull (1989) Production veglletable crops. Mosul University. Press. Iraq. (In University. T. Ray (1989) Tetraploid mashkmelon. Hort. Sci.,
- 8. Muhamad (1985) Comparision between diploid and tetraploid plants in Egyptian clover (*Trifolum alexandrinum l.*)
- Perry, E. N., Ugent, & D. Ray (1989) Tetraploid mashkmelon. Hor. Sci., 24: 751-752.
- Sharma, A. K. & A. Sharma (1982). Chromosome techniques: theory and practice. Butterworth Publishing Co., London.
- 11. Welsh, R. J. (1981). Fundamentals of plant genetics and breeding. Jun Wiley and Sons. N. Y.

# استجابة محصول الماش لعدة تراكيز من الكولشسين في احداث التضاعف (Vigna radiate L.)

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#### الخلاصة

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اجريت هذه الدراسة في مشتل قسم الأنتاج النباتي/ كلية الزراعة / جامعة صلاح الدين/اربيل في الموسم الصيفي 2008–2009 لمعرفة تأثير (24 المحلول المائي للكولشيسين (0.1، 2.0) % و بفترتين زمنيتين (24 و رامائي للكولشيسين (0.1، 2.0) % و بفترتين زمنيتين (24 و رامائي للكولشيسين (0.1، 2.0) % و بفترتين زمنيتين (24 و رامائي للكولشيسين على محصول الماش الأسود باستخدام تركيزين مختلفين من المحلول المائي للكولشيسين (0.1، 2.0) % و بفترتين زمنيتين (24 و رامائي للكولشيسين (0.1، 2.0) % و بفترتين زمنيتين (20) و رامائي و بفترتين زمنيتين (21) ساعة لنقع البدور بالأضافة الى معاملة المقارنة بهدف استحداث نباتات رباعية المجموعة الكروموسومية و مقارنتها بالنباتات الثنائية المجموعة الكروموسومية. اعطت المعاملة (0.10% و 12 ساعة) افضل النتائج بالنسبة لعدد النباتات الرباعية المستحدثة والتي تميزت بهذه الصفات وهي زيادة كل من المساحة الورقية، عدد التفرية، الوزن الطري للقرنات، وزن البذور مع النقص في ارتفاع النبات و المادة الجافة عند مقارنة النباتات المساحة الورقية، عدد التفريات، وزن القرنة، وزن القرنة، الوزن الطري للقرنات، وزن البذور مع النقص في ارتفاع النبات و المادة الجافة عند مقارنة النباتات الرباعية مع النباتات و المادة الجافة عند مقارنة النباتات الرباعية معانيات ما عدا المادة الجافة، وزن القرنة، الوزن الطري للقرنات، وزن البذور مع النوم في كل الصفات ما عدا عدد التفرعات والمادة الجافة، وتم الرباعية مالياتات الرباعية في كل الصفات ما عدا عدد التفرعات والمادة الربا