# MODIFIED MASS SELECTION WITHIN CORN SYNTHETIC VARIETY

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**ABSTRACT**

**This research was undertaken to evaluate five cycles of modified mass selection to improve grain yield in synthetic corn (*Zea mays* L.) variety IPA-5018. The selection was carried out in spring and fall seasons, during, 2013-2015 using 10% selection intensity. The five populations obtained after selection and the original population were evaluated. The experimental design was a randomized complete block design with five replications. The results were revealed a significant differences among selection cycles in grain yield and some yield components. The cycle five produced highest grain yield (9699.30 kg.ha$^{-1}$) and increased 34.88% to the original population. The regression of grain yield, number of grains.ear$^{-1}$ and grain weight to selection cycles were significantly linear and $R^2$ more than 80%. We concluded that the modified mass selection could be used successfully in improving the grain yield and some yield components of corn synthetic varieties.**

**Key words ; grain yield , yield components , improvement, regression.**



## الانتخاب الاجمالي المحور في الصنف التركيبي من الذرة الصفراء

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**المستخلص**

نفذ هذا البحث لتقييم خمس دورات من الانتخاب الاجمالي المحور لغرض تحسين الصنف التركيبي اباء 5018 من الذرة الصفراء (*Zea mays* L.). نفذ الانتخاب في الموسمين الربيعي و الخريفي خلال 2013–2015، باستعمال شدة انتخاب 10%. أدخلت الدورات الانتخابية الخمسة مع المجتمع الاصلي في تجربة مقارنة حسب تصميم القطاعات الكاملة المعشاة و بخمسة مكررات. أظهرت النتائج وجود فروقات معنوية بين الدورات الانتخابية الخمسة والمجتمع الاصلي في حاصل الحبوب وبعض مكونات الحاصل. أنتجت الدورة الانتخابية الخامسة اعلى كمية حاصل للحبوب (9699.30 كغم . هـ–1)، وتفوق على المجتمع الاصلي بنسبة 34.88 %. وجدت علاقة خطية بين حاصل الحبوب وعدد الحبوب. عرنوص$^{-1}$ ووزن الحبة والدورات الانتخابية وكانت قيمة معامل التحديد اكبر من 82%. يستنتج من نتائج البحث بأمكانية استخدام الانتخاب الاجمالي المحور بنجاح في تحسين حاصل الحبوب ومكوناته في الذرة الصفراء.

كلمات مفتاحية: حاصل الحبوب، مكونات الحاصل، تحسين، انحدار.

## INTRODUCTION

Corn is an important food crop in the world. Dent corn that is a special corn type can be used as food in several countries and animal feed. Moreover, dent corn starch is unique and has high amylopectin content, which gives high possibilities in industrial use. Mass selection was the oldest and the simplest breeding systems, and it is generally applied on an individual basis for the improvement of population for specific trait, and this method could be effective for selection of the traits that can be identified before or at the time of flowering. Recently, modified mass selection for prolificacy and ear length has been used effectively for yield improvement in corn (13,17). This method was modified by Gardner (8) and named modified mass selection. The objective of the modification was to homogenize the environmental effects to the population and increase the correlation between the phenotypic and genotypic characters. The responses to selection are preferable because the new population have better agronomic traits (1,2, 9,14). Early maturity is more suitable for many cropping system, and shorter plants with lower ear placement are more resistant to lodging (10). As correlations between whole ear yield with days to tasseling and days to silking were not significant, selection for early maturity for a limited extent would not detrimental to whole ear yield (3,4). Modified mass selection is a rapid and convenient method for population improvement for yield and density of kernels (12). The improved populations can be used as germplasm source for high yield and yield components in corn breeding programs (19 , 20). Mass selection is the simplest and inexpensive because as common method for population improvement in cross pollinated crops, and this method could be more effective for selection of the traits that can be identified before or at the time of flowering. The increase of grain yield potential of the most cultivated traditional maize populations in Iraq without modification of the characteristics needed by producers and consumers will generate higher yielding populations very close to the initial populations for other traits. The objective of this study was to evaluate the effectiveness of mass selection to improve grain yield and some yield components of corn.

## MATERIALS AND METHODS

The modified mass selection experiment was carried out to the corn (*Zea mays* L.) synthetic variety IPA-5018, at the Framer field soush Baghdad Governorate, during spring and fall seasons, 2013 - 2015. Five cycles of modified mass selection were conducted in an isolated field with 10% selection intensity (16). During selection seasons the grid system, 50x50 cm between and within the rows (equal distances) and subdividing the fields to square plots of 100 plants each, leaving an unharvested border around the plots, (8). In fall season 2015 a field experiment was conducted to compare five cycles of modified mass selection, C1, C2, C3, C4 and C5 and original population, C0, using randomized complete block design with five replications. The soil and plants management used as reommended by the researchers. The nitrogen fertilizer as urea (46% N) was used as nitrogen sources, of rate of 200kg.ha$^{-1}$, splitted in two applications; during third leaves initiation and flowering stage. Superphosphate fertilizer (45 % $P_2O_5$), was added with 100 kg.ha$^{-1}$ during soil preparation (5, 11). The genotypes were planted during the first half of March in Spring season and second half of Fall season in each year. The plants space of varietal trail (in fall season, 2015) was 0.75 m. between rows and 0.25 m. within the rows, (6, 7). During growing seasons hand weeding and irrigation were applied when needed. The results were analyzed using analysis of variance and the means were compared by LSD. Regression of grain yield and yield components on selection cycles were studied, (18).

## RESULTS AND DISCUSSION

### Number of ears .plant$^{-1}$

The exotic and local developed corn genotypes in Iraq were known, non prolificacy types (4). For this reason the yield component character didn't use as selection index. Table 1 revealed no significant difference among original and selected populations , the means of highest number of ears .plant$^{-1}$ not more than 1.14. ears. So, to increase the number of ears.plant$^{-1}$ to prolificacy, more than two ears. plant$^{-1}$, a crossing program could be successful to develop prolificacy genotypes, (21).

**Number of grains. ear$^{-1}$**

This agronomic trait one of the important traits correlated to grain yield, directly and indirectly, which found through path way analysis, by Baktash and Al-Aswadi (3), and Baktash and Wuhaib (4). Table1 indicated that modified mass selection very effective to the number of grains.ear$^{-1}$ and caused significant differences among selection cycles in this character. The plants at the cycle 5 produced ears with highest number of grains. ear$^{-1}$ (635.44 grains) in comparison to the original population, which produced 510.50 grains. ear $^{-1}$. The selection cycles C1, C2, C3, C4 and C5, increased number of grains .ear$^{-1}$ with, 13.62, 15.64, 19.49, 22.60 and 24.47 % in comparison to the original population. But, when we compare the percentage of the number of grains. ear$^{-1}$, which increased in each cycle, it was revealed that the C1 increased the number of grains. ear$^{-1}$ to the original population was 13.62%. But C5 increased the number of grains.ear$^{-1}$ to the C4, was 1.67. This showed that the first cycle, could be had higher variation in comparison to C4. We can concluded that the latest selection decreased selection gain. The Figure 1, showed linear response of number of grains. ear$^{-1}$ to the selection cycles, with regression coefficient 22.341 grains. ear$^{-1}$ for each cycle and $R^2$ = 86.68.

**Weight of 300 grains . gms$^{-1}$ ;**

The grain weight was important and highly correlated with grain yield in corn (3 , 4). From the path analysis of different corn traits specially the path between grain yield and it's components, revealed that the grain weight could be used successfully as selection index in corn improvement (4).Table 1 revealed that the modified mass selection very effective in corn grain weight improvement. The plants produced from the population of cycle five produced higher 300 grains weight (85.86 gms), in comparison to the original population (79.23 gms). But, the highest increase in grain weight produced from the plants of the first cycle in comparison to the selection gain of other cycles.The reason could be due to highest variation within original population. The Figure 2 showed linear response of grains weight to the selection cycles and regression coefficient 1.1506 with $R^2$=0.8255.

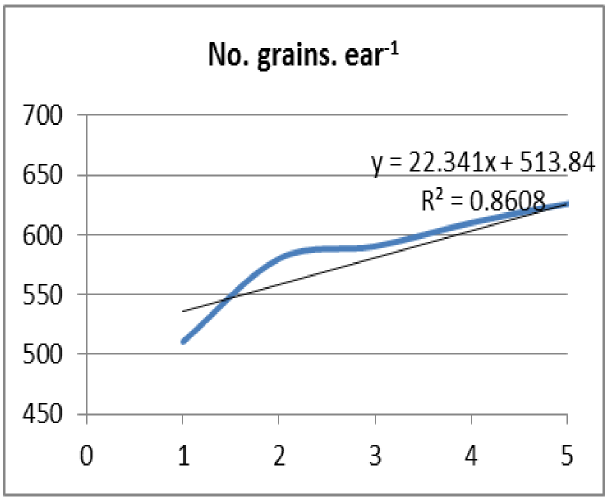


**Figure 1. Regression of number of grains.ear$^{-1}$ of corn to five modified mass selection .**

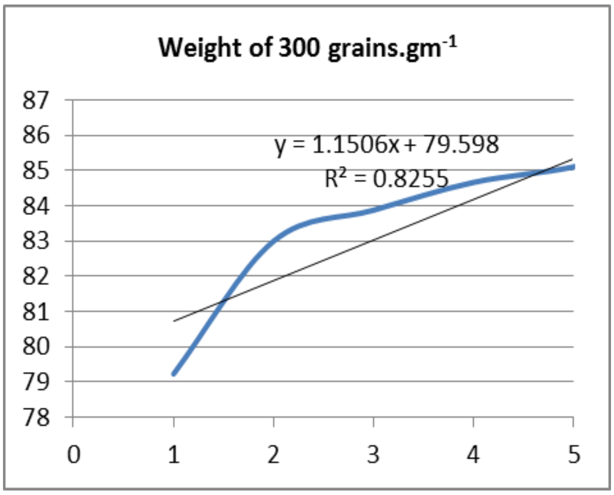


**Figure 2. Regression of weight of 300 grains.gm$^{-1}$ . of corn to five modified mass selection**

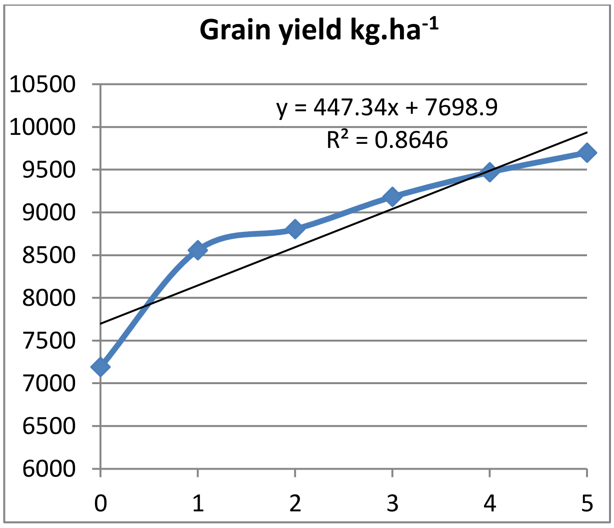


**Figure 3. Regression of corn grain yield kg.ha$^{-1}$ to five modified mass selection .**

**Grain Yield kg.ha$^{-1}$**

The corn grain yield production depend to the one or more of it's components (9). Several Researchers (2 , 3, 4), found highly direct and indirect correlation among grains. ear$^{-1}$ and grain weight. Table 1 indicated that the modified mass selection increased corn grain yield. The plants of the cycle 5 produced significantly highest grain yield ( 9699.30 kg.ha$^{-1}$), while the plants of the original population produced the lowest grain yield (7190.52 kg.ha$^{-1}$). The superiority of selection cycles took linear response with $R^2$=0.8646 and the coefficient of regression 447.34 kg, this revealed that each selection cycle was added on the average 447.34 kg.cycle$^{-1}$. As, we mentioned earlier increased in grain yield in the selection cycle 5. We can conclude that modified mass selection cycle very effective to improve, number of grains. ear$^{-1}$, grain weight and grain yield of corn, especially when the population under selection charactarized by highest genotypic and phenotypic variation.

**Table 1. Means of grain yield and yield components for the five cycles of modified mass selection and original population.**

| Cycles | No. ears. plant$^{-1}$ | No. grains. ear$^{-1}$ | Weight of 300 grains.gm$^{-1}$ | Grain yield kg.ha$^{-1}$ |
|---|---|---|---|---|
| C0 | 1.12 | 510.50 | 79.23 | 7190.52 |
| C1 | 1.13 | 580.02 | 83.00 | 8558.46 |
| C2 | 1.14 | 590.35 | 83.88 | 8803.24 |
| C3 | 1.14 | 610.00 | 84.67 | 9181.93 |
| C4 | 1.14 | 625.88 | 85.11 | 9469.92 |
| C5 | 1.14 | 635.44 | 85.86 | 9699.30 |
| Means | 1.14 | 592.03 | 83.63 | 8817.23 |
| LSD 5% | N.S. | 51.83 | 2.46 | 1033.00 |

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