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5. SUMMARY

Although the need for the increased production of summer fodder is so keenly felt in Egypt, the plant breeders did not focused much of their attention to improving fodder teosinte. Even in foreign countries few varieties are available for this purpose.

The improvement of teosinte still requires basic information about the genetic architecture of this forage crop. The knowledge of gene action would therefore be of great importance to plant breeder, as it provides information about possible improve of different fodder yield component traits. Hence, this study has been done for partitioning the genetic variance to its components for fodder traits through studies on different generations of the promising hybrids of teosinte, which observed during our previous investigations. In addition, consideration was given to study the possible association existed between some pairs of fodder traits as well as to study the diversity among teosinte entries using protein electrophoresis.

The genetic materials used in this investigation included four teosinte races, representing a wide range of diverse geographic origins. One of them was adopted to the Egyptian conditions named Rayana and the other three races were exotic from Mexico named

Balsas, Central Plateau and Guatemala. All possible combinations excluding reciprocal among these four races were made.

Seeds of these F1 hybrids and their parents were sown in 1999 growing season for preliminarily evaluation. Three F1 hybrids were selected according to their superiority for days to the first cut and number of tillers per plant in order to carry out this investigation. Six populations; P_1, P_2, F_1, F_2, BC_1 and BC_2 for each cross were obtained. In 2000 and 2001 summer seasons, these entries were evaluated at Faculty of Agriculture Research Station, Mansoura University for the following traits: number of tillers per plant, plant height, number of leaves per plant, leaf area, leaves green weight to stems green weight ratio, green fodder yield per plant, dry fodder yield per plant and crude protein percentage in the three cuts.

The results of this study could be summarized in the following:

- Highly significant differences among populations within crosses as well as among populations were found within each cross with respect to all studied traits in three cuts. These results reflected the diversity and the different genetic constitution of parents for these traits in the studied crosses. Therefore, the comparison between genotypic means is valid and the partition of this

genotypic variance to its components could be made. Furthermore, years, crosses by years and populations within crosses by years in addition to population within each cross by years mean squares were significant in most of occasions. This indicates that these genotypes gave different performances at different environmental conditions.

- The best combination for fodder yield components was Guatemala × Balsas, which showed the highest means for most of studied traits through the three cuts compared by other two crosses as well as their parents. This finding reflected the presence of heterotic effect and the higher frequency of dominance genes controlling these traits in this cross. Therefore, it's F_2 generation appeared to be less than the F_1 hybrids means in most of studied fodder traits through the three cuts. Regarding to the other two populations (Central Plateau × Balsas and Rayna × Balsas), F_2 generations appeared to be higher in means than their respective F_1 hybrids in most of studied traits in the three cuts. These results may due to the presence of transgrassive segregations and the major role of additive as well as additive by additive gene action in the inheritance of fodder yield

components with respect to these two crosses. Generally the means of most backcrosses strongly tended to be toward the respective recurrent parents reflecting also the role of additive and epistatic gene effect.

- Positive heterotic values relative to higher parent were observed in the cross Guatemala × Balsas in the three cuts in all studied fodder traits except for leaves weight/stems weight ratio (L/S ratio) in the 1st and 2nd cuts, while negative values were observed in most of occasion for other two crosses, indicating the superiority of this cross Guatemala × Balsas and the presence of high frequency of dominance genes in its parents.

- The results showed that the estimates of mean effect (m) which reflects the contribution due to the over all mean plus the locus effects and the interaction of the fixed loci was found to be highly significant for all studied fodder traits with respect to the three crosses in the three cuts. This finding reflects the contribution of additive, dominance and epistatic gene effects in the genetic expression of these traits. Regarding the crosses of Central plateau × Balsas and Guatemala × Balsas, the dominance gene effects were Positive or negative significant for all studied traits

except for number of tillers/plant (3rd cut), number of leaves/plant (three cuts), 5th leaf area (1st cut), leaves/stems ratio (2nd and 3rd cut), green fodder yield/plant (three cuts) and dry fodder yield/plant (1st cut) in Central plateau × Balsas. These values were higher in magnitude than the corresponding values of additive gene effects in most of occasions, indicating the major role of dominance gene effects. Furthermore, the results showed that most of studied traits were significantly influenced by one or more type of epistasis effects, which included additive × additive, additive × dominance and dominance × dominance gene effects as appeared in the three studied crosses, indicating the role of non-allelic interaction in the genetic expression of fodder traits.

- The heritability in broad sense estimates were larger in magnitude than the corresponding values in narrow sense and the dominance degree ratio exceeded unity for most of fodder yield components with respect to the three studied crosses. These results insure the role of over dominance in the genetic expression of these traits. Therefore, the production of F_1 hybrids could be the best method for improving teosinte forage yield components.

- A significant positive genotypic and phenotypic correlations were observed between green fodder yield/plant and each of number of tillers/plant, plant height, number of leaves/plant and dry fodder yield/plant. Dry fodder yield per plant was positively associated with each of number of tillers/plant, plant height, number of leaves/plant and 5th leaf area at genotypic and phenotypic levels. In general, the coefficient of genotypic correlation were larger in magnitudes than the corresponding values of phenotypic correlations indicating that these pairs of traits are strongly genetically associated to each other. Therefore, the selection for one of these traits will be associated with improvement the other traits during the selection program.

- Although, nine out of 18 bands are common in teosinte, the band number 18 was found only in the parental race Central plateau. Therefore, it could be considered as a specific marker for this race. In addition, the high similarity was observed between the F1 hybrids (Guatemala × Balsas) and one of its parental races (Guatemala). This finding may explain the presence of heterosis over better parent in this cross wit respect to fodder yield components.

In Conclusion, from the previous results, the Guatemala × Balsas hybride was the best for forage yield. So, it could be cultivated directly and/or consider the source of selection new lines with highly significant combining ability for production new F_1 hybrids.