

# The Effect of Combined Cultivation of Sorghum on Eco-physiological Characteristics of Single Cross Corn 704 in 2 Cultivation Paradigms

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## ABSTRACT

In order to eco-physiological aspects of (*Sorghum bicolor* L.Moench) intercropping in two planting pattern of single cross corn 704 (*Zea mays* L.) in Och-Tappe village of Miandoab from 2004 to 2005. The experiment design was factorial in RCBD arrangement with three replications. The treatments were: a combination of three levels of Sorghum densities (4, 8 and 16 plants per meter of corn row) and two planting patterns (common and two zigzag rows) of corn. The treatments lacking corn weed in two planting pattern was considered as control. Seeds of Sorghum were planted on the sides and end of corn rows in zigzag between corn plants. Results showed that Sorghum caused significant decrease in grain yield, biological yield and harvest index of corn. With increase in Sorghum population in chlorophyll amount of corn leaves decrease. The effect of Sorghum densities on characteristics of corn was greater than planting pattern. The effect of Sorghum densities rose with its density increase.

**Keywords:** corn, Sorghum, inter cropping, density, planting pattern.

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## INTRODUCTION

Corn is the third mostly cultivated grain with 138.5 million hectares cultivation and 589.4 million tones production in the world after wheat and rice [1]. Corn cultivation is about 500000 hectares in Iran which supplies 43% of internal demand [2]. Tulnar[3] believes that 20 tones grain is produced in a hectare from present hybrids according to performance records. Increase of corn performance potential does not seem a suitable genetic strategy [4]. Genetic improvement of corns is caused by resistance increase in North America along last decades. In fact, modern hybrids of corn show more resistance to high cultivation densities and improvement of tension resistances such as weed interference, low nitrogen of soil and moisture seem necessary [4]. Spatial arrangement means horizontal plan of plant accumulation and distribution which affect reciprocal relations among peripheral plants. Fisher and Miles [5] represented that plant arrangements (cultivation paradigm) is a significant factor in interference in a way that the least benefit is gained by weeds in plant cultivations of square and triangular. Density of plant, spatial arrangement, kind of plant and competition power changing affects plant population [6-8]. Density and interference of sorghum to corn are of especial significance. Seyyed Sharifi[9] declared that total biomass, relative growth, production growth and pure absorption will decrease in comparison to pure cultivation as density and long-term interference increase because of shadow and light decrease. Also, he investigated some characteristics and performance of corn and showed that increase of effective period of sorghum increases corn height. One important and permanent instance of agriculture is multi-cultivation system. Combined cultivation which is a main form of multi-cultivation increases agricultural performance in the case that it is managed right and regularly [9].

## MATERIALS AND METHODS

This study was performed in a farm in Ooch Tape Kurd village located in 5km north western of Miandoab of West Azerbaijan province for 2 years (2002, 2003). The site was 46° and 9' longitude and 36° and 58' latitude and its height from sea level was 1371m. Average annual rainfall of experiment site is 312mm and the soil was sand-loam.

The experiment was done every 2 years in factorial form on the basis of accidental blocks in 3 replicates. Kurt dimension was 4×5m<sup>2</sup> containing 6 cultivation rows. Single cross corn 704 with equal density in 2 levels of common and 2-lined zigzag cultivation and grained sorghum in 3 levels containing 4, 8 and 12 plants in a meter were studied. Control lacked sorghum and the comparison was carried out between mono-cultivation under combined cultivation to grained sorghum. The site was cultivated with canola the previous year and 200kg phosphate ammonium fertilizer and 150kg urea were spread there through disking twice. In stage of 2-3 corn leaf, 200kg urea was spread in strip way. Every 2-year experiment's information was variance analyzed

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separately. Then, 2-year variances were tested equally for each characteristic and characteristics of equal variances were tested combined along 2-year experiment. Variance analysis of data was done in factorial form and accidental blocks through SAS system. The means were compared on the basis of Duncan's multiple range test and the graphs were drawn through Excel system.

## RESULTS AND DISCUSSION

Various cultivation paradigm of corn in possibility level of 5% affected significantly grain yield (table 1). Different densities of sorghum grain affected chlorophyll of leaf, biological yield and grain yield corn in possibility level of 1%. When sorghum density increases, a relative decrease can be observed in these characteristics. SeyyedSharifi *et al.* [10] investigated density and interference periods of sorghum on corn growth and concluded that the more the density and interference period, the less total biomass, relative growth, pure absorption velocity and production growth will be. This can be resulted from decrease of leaf surface, competition and plant shadows on each other according to light resource accessibility. The highest shadowing percentage (60%) and 38% decrease in leaf surface with thorough sorghum interference to corn is related to pure cultivation of corn. SeyyedSharifi *et al.* [9] studied density and interference of sorghum on growth performance of corn and resulted that the increase of density and interference period will increase plant height and decrease corn performance. If the density and effective period are decreased, the performance of corn would not be decreased.

The effect of grained sorghum on corn in zigzag cultivation is less than the common cultivation. Bazrafshan *et al.* [11] concluded that cultivation paradigm will significantly affect dry material, green corn, grain, corn height and other characteristics related to performance in 2-lined cultivations.

Table1. Combined variance analysis of corn characteristics

Change resources	Freedom degree	grain yield	biological yield	Chlorophyll of leaf	harvest index
Year	1	3465/25	11941/36	21362/19	94711/06
Year/replica	4	2891/13	4762/11	9841/73	78621/01
Treatment paradigm (corn)	a 1	5196/89*	19863/96	31644/23	8317/64
Treatment densities (sorghum)	b 2	9169/12**	6411/90*	11215/56**	6551/15*
year× treatment a	1	1746/72	44170/00	190862/05	19441/10
year× treatment b	2	1016/41	21795/62	213615/38	5548/17
a× b	2	13259/35	92567/14	804121/11	37696/47
year× a× b	2	2736/09	23356/23	310765/06	53106/49
Error of b	20	513/95	35123/43	160169/61	825841/02
C.V		5/91	7/03	9/33	8/96

\* and \*\* respectively represent significance of 1 and 5 percentages

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