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EFFECTS OF WILD OAT (AVENA FATUA L.) DENSITY ON WHEAT (TRITICUM EASTIVUM L.). YIELD AND YIELD COMPONENTS

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ABSTRACT

The experiment was conducted under field condition at Jimma University, College of Agricultures and Veterinary Medicine (JUCAVM) to determine the effect of various wild oats (Aveva fatua L.) densities on yield and yield components of Wheat (Triticum eastivum L.). The experiment design used was the randomized complete block design and each of the experimental treatment was replicated three times. A Wheat cultivar, Digalu was grown with (0, 20, 40, 60 and 80) Wild Oat densities as a treatment. Data were recorded on wheat plant height, number of tillers, fresh weight and dry weight. The result revealed that various Wild Oats densities statistically (p≤0.05) affected plant height, number of tillers, fresh weight and dry weight. The maximum values of all the parameters were recorded in the (0) Wild Oat density as well as from Wild Oats density (20). Whereas, the minimum values of these parameters were recorded where (80) wild oats densities were present. From the study it could be concluded that Wheat yield and yield components were greatly affected by Wild Oat densities. Judicious control measures for wild oats are recommended to be adopted that can control Wild Oats in Wheat crop to reduce the crop losses due to this noxious weed.

Keywords:
Wheat, Wild Oat density, Weed, Weed competition.

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1. INTRODUCTION

Wheat *(Triticum aestivumL)* belongs to the family Poaceae, tribe Hordae and genus Triticum. Common Wheat is hexaploid with 4 chromosomes and botanically known as *Triticum aestivum L*. It is an annual self-pollinated and photo periodically long day plant. The cereals of the grass family producing large edible grains provide about one half of man food calories and large parts of his nutrient requirement. Wheat is foremost among cereals, and indeed among oil crops, as direct source of food for man (Peterson, 1965) [10].The increase in wheat production, more than any other crops, has allowed food supply to keep pace with world population growth. Of all the wheat grain consumed, it has been estimated that 65% is used directly as food for humans, 21% as feed for livestock, 8% as seed and 6% for other uses including industrial row materials, in addition, much of the stem and leaf is exploited either as strow or less commonly as fresh forage (Gooding and Davies, 1997) [6]. Ethiopia is the largest wheat producer in the sub-Saharan Africa in about one million hectares.

Wheat *(Triticum aestivum L.)* being the stable food, occupies more than 41% of cropped area world wild. Yield loss due to weed competition in Wheat field has been reported to be about 21%.Over last three decades wheat production in many part of the world have relied heavily on herbicide as primary method of weed management. But environmental safety concerns, increasing occurrence of herbicide resistance in weed species and need to reduce input costs have caused a growing awareness that intensive use of chemical weed control does not fit well in sustainable agriculture system. If a crop cultivar can tolerate weeds, it may reduce the need for synthetic herbicide (Gealy *et al*., 2003) [5].Generally weeds are always considered harmful plants. Weeds are one of the biggest threats to agriculture (El-Khatib and Hegazy, 1999) [4]. They use the soil fertility, available nutrients, and moisture, and compete for space and sunlight with the crop plants. This not only results in yield reduction but also deteriorates the quality of the produce, hence reducing the market value of crops. It has been estimated that crop losses due to weed competition throughout the world as a whole are greater than those resulting from the combined effects of insect pests and diseases. There are thus several reasons for entirely eliminating weeds from the crop environment. With the rising costs of labor and power, the use of herbicides will be the only acceptable method of weed control in the future (Young *et al*., 1996) [11].

Weeds are one of the major problems in wheat production. They compete with Wheat plants for light, moisture, nutrients and space. Weeds also increase harvesting costs, reduce quality of the produce, clog waterways, and increase fire hazards (Arnon, 1972) [2]. Weed competition with wheat could be either broadleaf or grasses. Wild oat (*Avena fatua*) is the grassy weeds, which have now become a threat to the nutritional requirement of mankind. Wild oat was described as a vigorously growing weed with a capability to attain greater height, and establish and develop extensive leaf area and horizontal branches when moisture and nutrients are not limiting. These morphological and physiological characteristics of wild oat allow it to shade and suppress the growth of its neighbors to a level that causes yield reduction. It is an annual grass and difficult to eradicate because the seeds shatter before crop maturation and many of the seeds are plowed into the soil, where they lie dormant for one to many years, and germinate when they are turned up near the surface.

As the density of Wild oats increases, wheat yield decreases. Wheat yield loss was below 1% up to 3 plants of Wild oats meter per square reached 2.2% at 5 plants and was 50-60% at 100 plants of Wild oats per m^2. (Pervaiz and Quazi1999) [9] reported that17.25% yield losses are caused to by Wild oat weeds. But the competitive effect of Wild oat on wheat crops hasn`t been well studied. Therefore, the objective of this study was to evaluate different Wild Oats densities on Wheat Yield and Yield components.

2. MATERIALS AND METHODS

Description of study area: The experiment was conducted in Oromia region, Jimma Zone south west part of Ethiopia at Jimma University College of Agricultures and Veterinary Medicine (JUCAVM) under field condition in the year 2016. The area is geographically located at about 7^o, 33^oN Latitude and 36^oS, 57^o E longitude at altitude of 1710 meters above sea level (m.a.s.l). The mean maximum and minimum temperature are 26.8^oc and 11.4^oc respectively and the mean maximum and minimum humidity is 91.4% and 31.2% respectively. The annual rain fall of the area is estimated to be 1500mm. The soil of the experimental site is characterized by well drained clay to silty clay with P^H of 4.51.

The Experimental material: The experimental materials such as Wheat (Digalu variety), Wild Oat, Meter, Pegs, Fertilizer (DAP and UREA), Hoe, Rake, Axes, Spades and Shovel or Fork were used during the experiment.

Treatments and Experimental Design: The experiment was laid out in randomized complete block Design (RCBD) replicated three times consisted of five treatments of Wild Oat densities (0, 20, 40, 60 and 80). Thus, there were 5x3 treatments resulting 15 experimental units. Therefore, totally 15 experimental units were used. The size of each plot was 1mx1m with path way of 0.5m between all plots spaces between rows were 20cm. and total area was 28 m2.

Field preparation: The land was cleared, ploughed (disked), leveled and large clods were broken down. Plant remnant, stalks, non-decomposed crop residues, all weeds, and other unwanted materials were removed manually. The soil was smoothed to the fine tilth and the land was laid out to evaluate the effect of Wild Oat density. The treatments were randomized by their chances according to randomized complete block Design (RCBD) design. Wild Oat densities of (0, 20, 40, 60 and 80) were prepared carefully and Digalu Wheat variety was sown by drilling.

3. DATA COLLECTION AND ANALYSIS

The following data were collected:

Tillering number: refers to all shoots that grow after the initial parent shoot grows from a seed. Tiller numbers in each plot were counted every (7) days from (6) representative Wheat plants randomly selected after it showed great emergence above the ground. Each representative plant was taken from five rows of each plot. The number of tillers was counted and then the average was obtained.

Plant height: It was measured from the ground to the average top of the terminal spikelet. Plant height was measured every (7) days after emergence above the ground from each (6) representative plans taken from five rows of each plot and then the average was obtained.

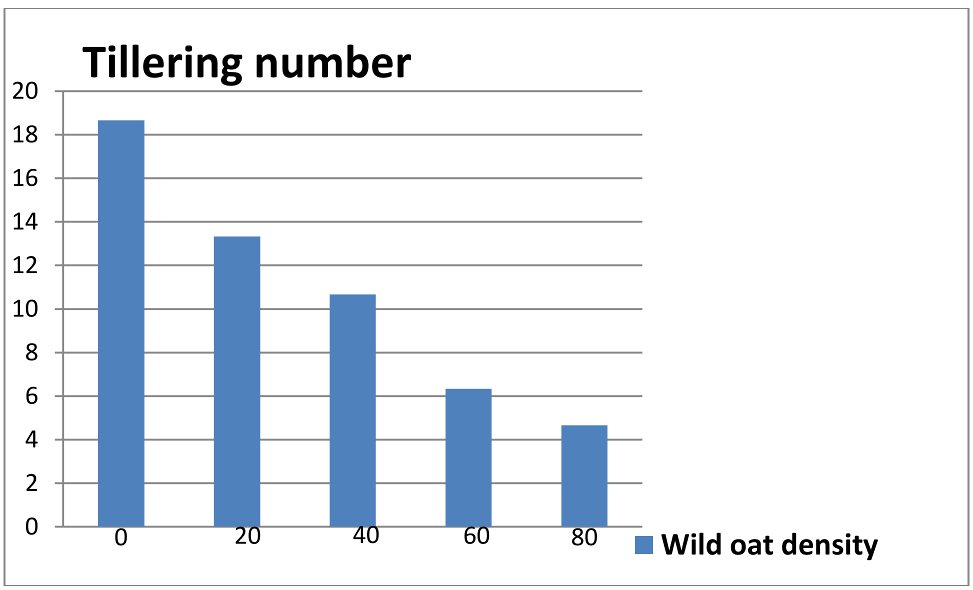
Dry weight and Fresh weight: the Wheat plants were removed from the soil and washed off any loose soil. Dry and fresh weight of the whet plan was followed by assessment of the weight and moisture content. Weights were determined before and after oven drying the Wheat plant samples at 80 o C for 24 h.Calculations of Wheat fresh weight, dry weight and moisture content were based on the following formula:

$$\frac{\text{Fresh weight - Dry weight}}{\text{Fresh weight}}$$

4. RESULTS AND DISCUSSIONS

Tillering Number

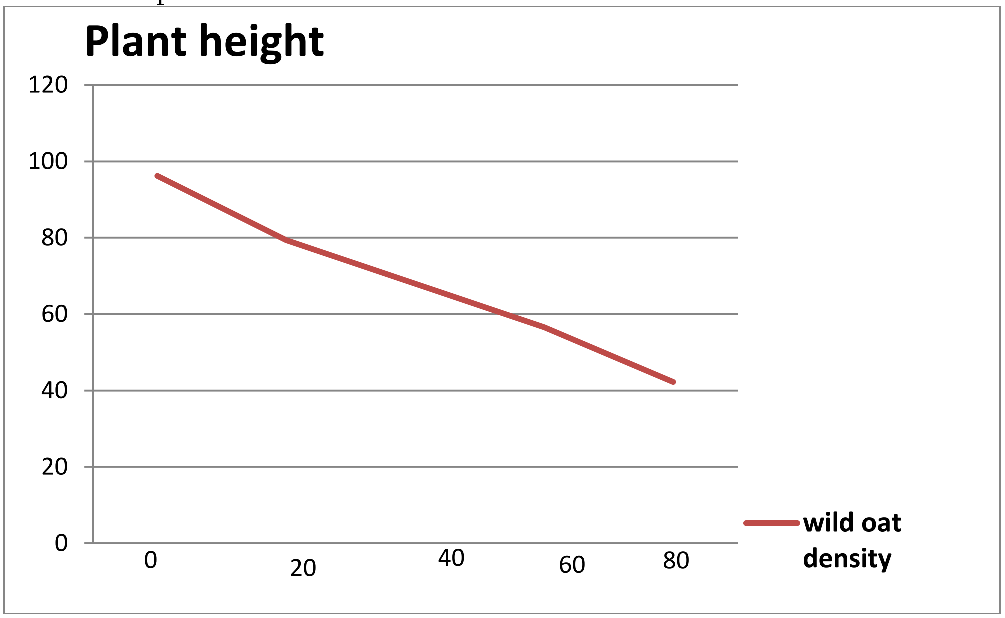
Statistical analysis of the data showed that tillering numbers of Wheat plant was significantly affected by Wild Oat densities. The data (Table-1) revealed that the maximum (18.667) tillers of Wheat were recorded from (0) Wild Oat density. The minimum (4.667) tillers of Whea were obtained from (80) Wild Oat density. Tillering numbers obtained from treatment(0) (20) and (40) were found significantly different from each other. However, tillering numbers of Wheat was statistically similar or non-significant at (60) and (80) wild oat densities. As increased the density level of Wild Oat, Wheat tiller plant decreased accordingly due to interspecific competition. These findings were supported by the earlier work by (Martin *et al* 1987) [8] and (Almeida *et al*., 2004) [1]. The data in (graph-1) exhibit that as wild oats density increased, tillering number of Wheat decreased.



Graph 1: Tillering number of wheat as affected by different Wild oats densities

Plant height (cm)

Plant height of Wheat was affected by various densities of Wild Oat. The data manifested after statistical analysis that Wheat plant height was significantly affected by Wild Oat densities. Statistical analysis of the data was showed that Wild Oat densities significantly effected Wheat plant height. Statistical analysis of the data showed that all treatments were significantly different from each other. The data (Table-1) revealed that the maximum (96.17cm) plant height was recorded from (0) Wild Oat density while the minimum (42.243cm)Wheat plant height was recorded at (80) wild oat density. Wheat plant height was probably higher at (0) Wild oat density due to no competition with Wheat plants while Wheat plant height was lower at (80) Wild Oat density because of higher competition with Wild Oat. Wheat plant height was decreased with the increase in Wild Oat density. The result was in agreement with Aziz *et al*. (2009) [3]. As clearly indicated from the (graph- 2) that Wheat plant height doesn't compete at higher levels of Wild Oat densities but compete at lower level of Wild Oats.



Graph 2: Wheat plant heights as affected by different wild oats densities

Fresh weight (gm)

Fresh weight of Wheat as impressed by various combinations of Wild Oat density was indicated in (Table-1).Statistical analysis of the data showed that Wild Oat exhibited significant effect on Wheat fresh weight. The data (Table-1) showed that, the maximum (858.40gm) fresh weight was recorded from (0) wild oat density while the minimum (107.67gm) fresh weight was recorded from (80) Wild Oat density. However, data showed that fresh weight of Wheat was statistically similar at (60) and (80) wild oat densities. The result revealed that Wheat planted alone (0) Wild Oat density recorded significantly higher fresh weight (858.40gm) or highly significant as compared to the remaining treatments. The results were in conformity with those of Hussain *et al*. (2012) [7]. As indicated from the table below (Table-2) that as Wild Oat density increased the fresh weight of wheat plant decreased.

Dry weight

Statistical analysis of the data showed that dry weight of Wheat plant was significantly affected by Wild Oat densities. The data (Table-1) revealed that the maximum (96.933gm) dry weight of Wheat was recorded from (0) wild oats density. However, the minimum (25.133gm) dry weight of Wheat was recorded from (80) Wild Oat density. Data showed that dry weight of wheat was highly significant at treatment (0) Wild Oat density as compared to other treatments (20,40,60,80) Wild Oat densities. The data (Table-1) showed that dry weight of Wheat plant was significantly different from each other at all treatment (0,20,40,60 and 80) Wild Oat densities. As Wild oat density increased, dry weight decreased accordingly due to interspecific competition. It was clearly indicated from the graphs that Wheat crop don't compete at higher levels as the density of Wild Oats increased.

Table 1: Mean of Tillering number, Plant height, fresh weight and dry weight of wheat as affected by different wild oat density

	Parameters			
Wild Oat density	TN	PH (cm)	FW (gm)	DW (gm)
0	18.667a	96.170a	858.40a	96.933a
20	13.333 b	42.243e	107.67c	91.567ab
40	10.667a	68.00c	346.33bc	25.133d
60	6.333d	56.600d	204.50c	42.867c
80	4.667d	79.333b	592.83ab	84.633b
CV	2.5609	8.6820	302.86	8.7379
LSD 0.05	1.1106	3.7650	131.33	3.7892

Means within the same column followed by different letter are significantly different at $P \leq 0.05$;**TN=**Tillering number, **PH=**Plant height, **FW=** Fresh weight,**DW=** Dry weight,**CV=** Coefficient of variance,**LSD=** Least significant difference

Table 2: Mean of fresh weight as affected by different wild oats densities

Wild oat density	0	20	40	60	80
fresh weight(gm)	858.40	592.83	346.33	204.50	107.67

5. CONCLUSION

The results showed the maximum wheat plant height (96.17cm), number of tillers (18.667), fresh weight (858.40gm) and dry weight (96.933gm) recorded in the control treatment. The minimum wheat plant height (42.243cm), number of tillers (4.667), fresh weight (107.67gm) and dry weight(25.133gm) of wheat were recorded where (80) wild oats densities were present. As the density of wild oats increased, , wheat tillers plant decreased accordingly to interspecific competition. Wheat plant height was probably higher at (0) wild oat density due to no competition with wheat plants while wheat plant height is lower at (80) wild oat density because of higher competition with wild oat. From this research finding, it could be concluded that Wheat plant height decreased with the increase in wild oat densities and wheat yield and yield components are greatly affected by wild oats densities. Accordingly, the analyzed data almost all the parameters of wheat recorded showed significant differences using various densities of wild oat. Generally, as the density of wild oats increased, wheat yield decreased.

6. ACKNOWLEDGEMENTS

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