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# RESPONSE OF DIFFERENT CORN (*Zea Mays* L) HYBRIDS TO FOLIAR FERTILIZATION DURING THE GRAIN-FILLING PERIOD[1]

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The response of eight corn hybrids, (Wf9 × W22, Mo17 × N28, B37 × Wf9, B37 × B70, B70 × B73, B73 × Mo14, Q97 × Q98 and Q51 × Q52) to foliar fertilization during the grain-filling period was investigated. Of these eight hybrids, only the hybrid (Q51 × Q52), a two-earred hybrid showed a significant ($P<0.05$) positive respone to foliar fertilization, and was therefore recommended as a potential candidate for further foliar fertilization studies and subsequent cultivation. Foliar fertilization had a significant effect ($P<0.10$) on mean ear length but this was not associated with grain yields. The effect of foliar fertilization on seed weight was not significant.

Foliar fertilization or foliar feeding involves the application of plant nutrients on all the aerial plant parts, particularly the leaves, and their subsequent absorption. The soil imposed problems of dilution, penetration and fixation of plant nutrients applied directly on the soil are circumvented through foliar fertilization (Mederski and Volk, 1956; Wittwer, *et al.*, 1963, and Schumacher and Welch, 1970).

During the grain filling period, the grains become the dominant physiological sink and the source for this sink is provided by mainly the leaves. The leaves, therefore become depleted in both nutrients and photosynthate during grain-filling, and if the depletion is severe enough these leaves may 'die' prematurely. It is maintained that foliar fertilization during this critical grain-filling period would minimize the depletion of nutrients and photosynthates from the leaves, thus, maintaining an adequate nutritional balance of the leaves and extending their life-span to prolong and maximize photosynthesis and consequently increase crop yields.

The different responses of various plant hybrids or varieties to applied nutrients had been discussed (Tisdale and Nelson, 1975). The nutrient requirement of a given hybrid differs from one another and as a result a given hybrid or variety may fail to develop the full potential of its yielding capacity under low fertility or nutritent deficiency conditions. Therefore, the selection of hybrids or varieties that can utilize to the fullest extent the supply of plant nutrients made available to them and are genetically capable of producing high yields is important to achieve a successful cropping system.

This experiment was conducted to investigate the response of different corn hybrids to foliar fertilization during

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the grain filling period, and to recommend the best-performing hybrid for further foliar fertilization studies and subsequent cultivation.

## MATERIALS AND METHODS

The experiment was conducted on the Iowa State University Agronomy and Agricultural Engineering Research Centre located about fourteen kilometers west of Ames. The soil at the experimental site is a Nicollet-Webster complex, but primarily Webster. The Webster and Nicollet soils are classified as Typic Haplaquoll and Aquic Hapludoll, respectively.

The Nicollet soil is loam to clay loam in texture, some what poorly drained with moderate permeability and moderately high plant–available water-holding capacity. The Webster soil is silty–clay loam in texture, poorly drained with moderate permeability and moderately high plant-available water-holding capacity.

The chemical properties of the plow layer (0-15 cm) of the site before the commencement of the experiment were as follows: soil pH and soil buffer pH 7.1 and 7.2 respectively; available phosphorus and potassium contents 36 and 127 ppm respectively; the former being medium and the latter being low-medium. The available nitrogen and sulfur contents, of the site were not determined but they were reported as low - medium.[8] The site received a basal application of 224 + 112 + 112 kg/ha of N, $P_2O_5$ and $K_2O$ respectively before seeding.

Eight different corn hybrids (Wf9xW-22, Mo 17xN28, B37xWf9, B37xB70, B70xB73, B73xMo17, Q97xQ98 and Q51xQ52) were hand planted in hills spaced 0.33 m apart within the row and in rows spaced 0.76 m apart. All hybrids were single-earred except the last two which were two-earred. The emergent seedlings were thinned to one plant per hill when they were about 30cm tall to reduce or eliminate inter-plant competition.

A split plot randomized block design of three replications was used in this study. Each hybrid of four rows wide, (3.05m) by 17 O m long was the main plot which was divided into two subplots. Each subplot was 3.05 m wide by 8.50 m long. One of the two subplots was treated and the other was untreated. Each treated subplot had four separate applications of foliar fertilizer spray hereafter referred to as spray, and received a total of 60 + 12 + 12 + 6 kg/ha of elemental N, P, K and S respectively of the spray Spraying was done at 8-day intervals or as weather conditions permitted to reduce or eliminate 'leaf burn'. The untreated subplots received no spray and were the control. The primary sources of N and S were urea (45% N) and ammonium sulfate (24% S) respectively and that of P and K was potassium polyphosphate (11.2% P, 20.7% K).

The molar concentration of the individual compounds in the spray was

0.083 M ammonium polyphosphate, 0.109 M potassium polyphosphate, 1 036 M urea and 0 .104 M ammonium sulfate. The spray was applied mainly on the plant leaves at the rate of 500 l/ha, beginning at twenty-one days after 75% silking. A portable hand sprayer with a medium drop-size nozzle and controlled air pressure of 2.11 $Kg/cm^2$ was used for spraying. Spraying was done in the morning between 7 and 10 a.m. to permit adequate absorption of the spray by the leaves. At the termination of the experiment, the central 7.60m of each of the two middle corn rows were harvested by hand. The corn grain yields and the yield components comprising ear length and seed weiaht were recorded.

## RESULTS AND DISCUSSION

The response of the different corn hybrids (Hb) to foliar fertilization is shown in Table 1. The mean grain yields of hybrids 3, 7, 5, 1 and 8 were increased but those of hybrids 2, 6, and 4 were decreased by foliar fertilization (Table 1). The least significant difference (LSD) of 11.65 q/ha at the 5% level for the differences in mean yields between the unsprayed and sprayed hybrids for any one hybrids showed that the grain yield of the sprayed Hb. 8 was significantly greater ($P < 0.05$) than that of the control of the same hybrid But, averaged over all the hybrids, foliar fertilization had no significant effect on grain yields. These response differences may be explained by both the variable responses of the hybrids to foliar fertilization and their yield potentials. The significant hybrid x spray interaction ($P < 0.09$) confirmed that the hybrids responded differently to foliar fertilization, although this was mainly due to the two - earred hybrids, Hence, partitioning the degrees of freedom for hybrid x spray interaction showed that Hb. 1-6 versus Hb.7-8 x spray interaction was significant ($P < 0.03$). However, the interaction between Hb.7-8 x spray and that within Hb. 1-6 x spray were not significant.

The response of seed weight and ear length to foliar fertilization of the different hybrids is shown in Table 1. Foliar fertilization had no significant effect on mean seed weight. However, seed weight was slightly but significantly ($P < 0. 10$) correlated with grain yield ($r = 0.27$), but this had little effect on the grain yield The low correlation between seed weight and grain yield may be explained by the fact that the kernels of most corn varieties are limited as to their maximum weight, thus limiting yield, regardless of how favourable the growing conditions may be during the grain filling period (Duncan, 1975).

Foliar fertilization had a significant effect ($P < 0\ 10$) on mean ear length or seed numbers, but this was not associated with grain yield. The differences in mean ear length among the hybrids were also significant ($P < 0.10$).

Table 1 : Response of Corn Hybrids to Foliar Fertilization

| Hybrid No. | Hybrid (Hb) | Mean grain yield, q/ha [a] | | | Seed weight, g [d] | | | Ear length, cm. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Unsprayed | Sprayed | Response | Unsprayed | Sprayed | Response | Unsprayed | Sprayed | Response |
| 8 | Q 51 X Q 52[b] | 75.1 | 91.6 | 16.5 | 30.3 | 30.0 | —0.3 | 20.4 | 20.3 | —0.1 |
| 1 | Wf 9 X W 22 | 74.2 | 81.3 | 7.1 | 31.3 | 31.3 | — | 20.7 | 20.3 | —0.4 |
| 5 | B 70 X B 73 | 85.2 | 90.8 | 5.6 | 33.3 | 32.7 | —0.6 | 20.6 | 20.2 | —0.4 |
| 7 | Q 97 X Q 98[c] | 91.6 | 96.1 | 4.5 | 34.7 | 35.5 | 0.8 | 20.3 | 21.2 | 0.9 |
| 3 | B 87 XWf 9 | 83.5 | 84.4 | 0.9 | 32.0 | 31.7 | —0.3 | 21.1 | 19.5 | —1.6 |
| 2 | Mo 17 X N 28 | 91.9 | 90.2 | —1.7 | 36.3 | 36.0 | —0.3 | 20.6 | 20.8 | 0.2 |
| 6 | B 73 X Mo 17 | 86.2 | 82.9 | —3.3 | 35.7 | 36 3 | 0.6 | 22.3 | 22.4 | 0.1 |
| 4 | B 37 X B 70 | 96.1 | 85.4 | —10.7 | 35 0 | 34.7 | —0.3 | 21.8 | 20.9 | —0.9 |

[a] LSD (0.05) = 11.65 q/ha.

[b] [c] Two earred hybrids; all others are single-earred

[d] Weight of 100 Seeds

There was no correlation between ear length and grain yield and this may be explained by the fact that ear length or the number of seeds produced per ear is not only affected by nutrition but also by other factors such as plant and environmental factors.

Of the eight hybrids studied, the hybride (Q51xQ52), a two-earred hybrid was recommended as a potential candidate for further foliar fertilization studies and subsequent cultivation.

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# CHEMICAL CONTROL OF POINTED GOURD VINE BORER, (*Apomecyna Saltator*) FABR.

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Several insecticides were tested against the pointed gourd vine borer, *Apomecyna Saltator* Fabr., a serious pest of pointed gourd. Isofenphos sprayed @ 0.5 kg a.i./ha killed 100% grubs feeding in the vines. Soil treatment with granular phorate, carbofuran, quinalphos or disulfoton or aldrin dust applied @ 1 kg a. i./ha during january killed 75 % grubs habitating in the roots left for ratoon crop. Maximum net profit of Rs 2.267 /ha was obtained when the crop was sprayed With quinalphos 0.5/kg a.i./ha at 280 days after planting (DAP) However, the benefit cost ratio was higher with phosphamidon treatment.

The pointed gourd (*Trichosanthes dioica* Roxb) is an important vegetable crop grown extensively in the Hirakud Command Area of Sambalpur, Orissa. The crop is propagated clonally through roots and is of three years duration. One of the major constraints of low production is the damage caused by the vine boring beetle (*Apomecyna saltator* Fabr.) in the peak reproductive phase of the crop. The grubs and adults are carried to the new plantation through

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