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The Effect of Pyridoxine and Different Levels of Nitrogen on Physiological Indices of Corn (Zea Mays L.var.sc704)

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Abstract**—**One field experiment was conducted on corn (Zea mays L.Var. SC 704) to study the effect of three different basic levels of nitrogen (90, 140and 190 Kg/ha as urea) with 0.01% and 0.02% pyridoxine pre-sowing seed soaking for 8 hours. Water-soaked seeds were treated as controled. biomass production was recorded on 45, 70 and 95 days after sowing. Total dry material (TDM), leaf area index (LAI), crop growth rate (CGR), relative growth rate (RGR) and net assimilation rate (NAR) was calculated form 45until 95 days after sowing. Yield and its components such as kernel yield, grain weight, biologic yield, harvest index and protein percentage was measured at harvest. In general, 0.02% pyridoxine and 190 Kg pure nitrogen/ha was shown gave maximum value for growth and yield parameters. N190 + 0.02 % pyridoxine enhanced seed yield and biologic yield by 57.15% and 62.98% compared to 90kg N and water – soaked treatment.

Keywords**—**Corn, Growth Indices, Nitrogen Levels, Physiological Indices, Pyridoxine.

I. Introduction

IT has been established that pyridoxine (vitamin B6) enhances the growth of root system [12, 14], which helps in higher nutrient uptake and leads to higher economic yield [10]. The work with regard to seed soaking treatment with pyridoxine and N and P has been proved promising in Corn [14, 7] moong and lentil [15]. The present paper reports the effect of interaction of pyridoxine with nitrogen on corn to assess the response.

Earlier studies in the authors' laboratory have established that pyridoxine (vitamin B6) is effective as well as economical in increasing the yield of barley [13]. Pyridoxine has long been known to promote the growth of excised organs of various plant species [4]. Its in the culture medium promotes the uptake of glucose, nitrate and phosphate in excised roots of grasses[2].

Cotton seed lings have been reported to possess higher concentrations of nitrogen and phosphorus as a result of treatment of the seeds with pyridoxine. Surprisingly, information on the effective ness of pyridoxine application on the growth and yield of crops grown under field conditions is meagre However, all previous in vitro, pot culture and field studies indicate that pyridoxine invariably enhances root growth of the plants studied so far[5]. This led us to suggest that, if this vitamin promoted root growth in legumes also, the absorption of nitrate and other nutrients would be enhanced by its application[16]. Simultaneously, a larger surface area would be provided for Rhizobium infection.The consequent increase in the number of root nodules would be expected ultimately to benefit the host through enhanced nitrogen fixation.This could be of considerable practical significance for farmers as it would result in better growth and higher productivity of these hitherto neglected crops. In addition, root growth, root nodule number and seed yield were also found to be significantly increased [13].

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II. Materials and Methods

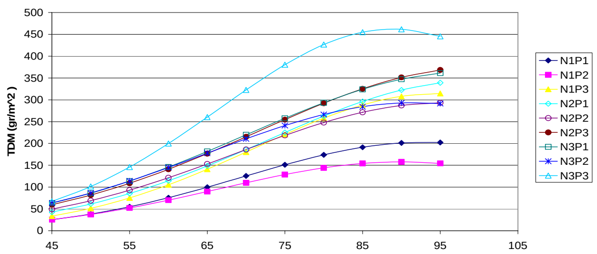
A field experiment was conducted on agriculture farm of Payame Noor University, Iran, on a slightly alkaline sandy loam soil (PH=8.1) seeds of corn was either soaked in distilled water for 8 hours or in 0.01% and 0.02 % aqueous pyridoxine hydrochloride solution and then sown in 27m² plots at the rate of 15 kg/ ha of corn under three basal nitrogen levels (90, 140, 190 kg N/ha). The source of phosphate was a uniform basal dose of 30 kg p and Potassium 30 kg K/ha for corn was added gradually after planting to all plots. Spacing of the plant was 75 cm between rows and 20 cm within a row for corn. The field was irrigated every eight days untill harvesting. to assess dry weight The plant was sampled at 45 and 95 days after emergent (DAE). In addition, total dry material (TDM), leaf area index (LAI), crop growth rate (CGR), relative growth rate (RGR) and net assimilation rate (NAR) were calculated by the method of Milthorpe and Moorby [11] and Watson [17], between 45-95 days after planting, fifteen plants were selected at random for the number of grain weight, biologic yiled, harvest index and percentage of protein and seed yield. Protein content in corn grain was determined by Nelson, D.W and L. E. Sommers, (1973). The data were statistically analysed by sas.

III. Results and Discussion

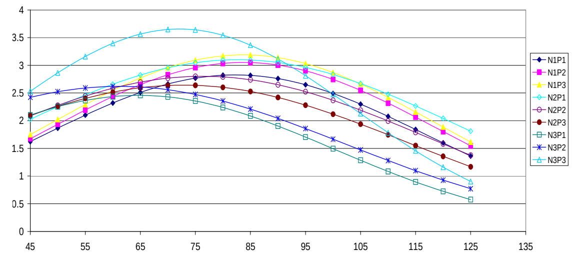
Total biomass and net assimilation rate (NAR) was significantly affected by nitrogen application and pyridoxine soaking treatment At all growth stages, (Table I and Figures). application of 190 kg N/ ha gave Maximum value for CGR and NAR at all growth stages. However, 190 kg N/ha produced maximum dry weight in corn. Pyridoxine soaking treatment (0.02%) proved best for dry weight. NAR was maximum in 0.02% pyridoxine in corn. Regarding interaction effect, N190×0.02 % pyridoxine gave significant maximum dry weight for crop; however, interaction effect for CGR and NAR was not significant (Figures 1,3,5). Among growth characteristics, dry weight is considered the most meaningful as all physio – chemical activites culminates in the production of dry matter. Application of nitrogen significantly enhanced the dry weight of corn at all stages of growth. Dry matter production, being mainly dependent upon the photosynthetic activity of the plant, one would expect a positive effect of nitrogen application on the net assimilation rate (NAR) in corn (Figures 1,2,5). It is evident that corn crop showed higher efficiency for use of nitrogen as compared to corn. Application of pyridoxine enhanced biomass production and NAR significantly. It may be mentioned here that pyridoxine soaking treatment enhanced the root growth [7] as pyridoxine acts as a root growth factor [1].

The enhanced nutrient uptake, helped in the proliferation of the leaf [7]which is clear from increased efficiency of photosynthetic surface shown by NAR resulting into enhanced dry matter production (Table I and Figures 2,4,5). Pyridoxine content in seed was 86.42% dry weight of seed. The yield contributing components such as kernel yield, grain weight, biologic yield, harvest index and Protein Percentage yield/ha were found higher due to N and pyridoxine treatment as compared to that obtained with controls (N90 and water soaked). Increase in kernel yield was noted as a result of application of increasing dose of nitrogen from N90 to N190. Among soaking treatments, 0.02% pyridoxine proved best for kernel yield. However, for biologic yield 0.01% and 0.02% pyridoxine resulted at per increase in seed and protein yield was 62.98% and 33.57% due to N190 nitrogen treatment (Table I).

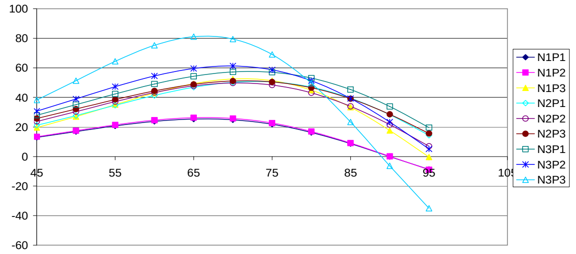
The higher yield in nitrogen–supplied plants was mainly due to increase in Kernel Yield In corn. This is not surprising as nitrogen is known to play a significant role in differentiation processes [6] and was found to affect all growth parameter positively in corn crop. The optimum concentration of pyridoxine was found to be 0.02% in corn. The increase in seed yield due to 190 kg N/ha and 0.02% pyridoxine was 57.15%. Seed treatment with pyridoxine was found to be a simple economical and efficient way to improve the yield of the crop.



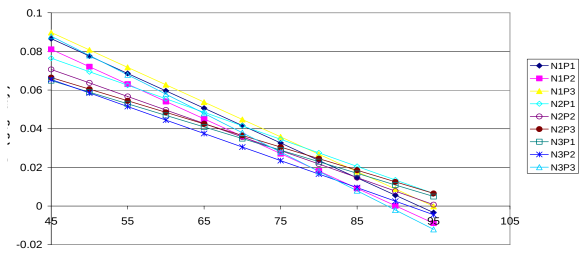
DAE (Day After Emergent)
Fig. 1 Growth Curve of Corn
(Zea Mays L.Var. Single Crass704)



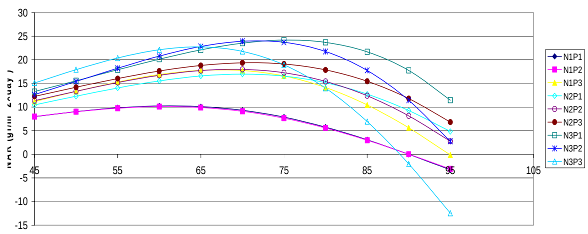
DAE (Day After Emergent)
Fig. 2 Laef Area Index Curve of Corn
(Zea Mays L.Var. Single Crass704)



DAE (Day After Emergent)
Fig. 3 Crop Growth Rate Curve of Corn
(Zea Mays L.Var.Single Crass704)



DAE (Day After Emergent)
Fig. 4 Relative Growth Rete Curve of Corn
(Zea Mays L.Var.Single Crass 704)



DAE (Day After Emergent)
Fig. 5 Net Assimilation Rate Curve of Corn
(Zea Mays L.Var. Single Crass704)

TABLE I
MEAN COMPARISON EFFECTS OF DIFFERENT LEVELS OF NITROGEN AND PYRIDOXINE ON YIELD AND YIELD COMPONENTS OF CORN (ZEA MAYS L.VAR.SC 704)

Treatments	Kernel Yiled (Kg/h)	1000 Grain Weight (g)	Biologic Yiled (Kg/h)	Harvest Index (%)	Percentage Of Protein (%)
Pyridoxine (P) %					
0(P1)	6331.41	247.34	24036.9	38.71	7.16
0.01%(P2)	6927.15	257.65	26057	39.96	7.35
0.02%(P3)	7326.24	266.62	28344.1	40.90	7.92
Basal Nitrogen (Kg/h)					
90(N1)	5510.45	230.74	22011.4	36.79	6.59
140(N2)	6904.41	258.08	25519.7	40.16	7.69
190(N3)	8169.95	282.79	30906.9	42.62	8.44
Interactions					
N1*P1	4902.9	221.85	19984	35.02	5.8
N1*P2	5436.01	231.4	22502.7	37.13	6.81
N1*P3	6192.45	238.99	23547.4	38.22	7.17
N2*P1	6401.07	250.94	24469.8	39.05	7.54
N2*P2	7104.5	260.45	25551.7	40.06	7.7
N2*P3	7207.64	262.83	26537.7	41.39	7.84
N3*P1	7690.25	269.33	27657	42.07	8.13
N3*P2	8240.95	281.1	30116.6	42.70	8.48
N3*P3	8578.63	298.03	34947.2	43.08	8.73
C.V%	5.77	3.61	4.95	3.81	4.75

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