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RESPONSE OF GARDEN CRESS (*Lepidium sativum* L.) TO SOWING METHODS, IRRIGATION INTERVAL AND FERTILIZER RATES IN NORTHERN GUINEA SAVANNAH OF NIGERIA

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ABSTRACT

Field trials were conducted in 2015 and 2016 at Samaru College of Agriculture, Division of Agricultural Colleges, Ahmadu Bello University, Zaria to determine the most appropriate NPK fertilizer rates, sowing method and irrigation interval for better growth and yield of garden cress in Northern Guinea Savannah. The treatments consisted of three factors; NPK fertilizer rates (NPK 0: 0: 0 kg ha^{-1}, NPK 30: 30: 30 kg ha^{-1} and NPK 60: 60: 60 kg ha^{-1}), sowing methods (broadcasting and drilling) and irrigation intervals (at 3 and 5 days). The treatments were laid out in a Randomized Complete Block Design (RCBD) replicated three times. The results obtained showed that sowing by drilling method and application of NPK fertilizer at the rate of 60: 60: 60 kg ha^{-1} significantly led to the production of more number of leaves, number of branches, tallest plants and vegetable yield, whereas, the use of irrigation water at the interval of 3 days significantly led to the production of more vegetable yield in both growing seasons. Therefore, it can be concluded that, for a better performance and yield, Garden cress should be drilled, irrigated at 3 days interval and supplied with NPK at the rate of 60:60:60 kg ha^{-1}.

Keywords: Garden cress; sowing methods; Irrigation intervals; NPK

INTRODUCTION

Garden cress (*Lepidium sativum* L.) is a very old crop that was cultivated in ancient times in Egypt due to its health benefits and it belongs to the family *Brassicaceae*. It is a green, cool season perennial plant used as a leafy vegetable, typically used as a garnish. Garden cress can grow to 60 cm in height, and produces white or light pink flowers and small seed pods. The nutrients content of Garden cress are vitamins A, C, minerals and foliate. Popular varieties include wrinkled, crumpled, Persian, crumpled and curly types.

Garden cress is a cool season annual plant and can grow in almost any type of soil, as long as it is moist and rich in nutrients. Cress will grow best in a well drained loam soil with pH between 6.0- 6.7. The plant should be grown in full sun or partial shade in areas where temperature get very high, cress plant will tolerate some frost (Allan and Dan frost, 2010).

Water is one of the most important inputs essential for the production of vegetable crops. It profoundly influences photosynthesis, respiration, absorption, translocation and utilization of mineral nutrients and cell division besides some other processes. At all stages of crop growth, water stress reduces photosynthetic efficiency (Yuan *et al.,* 2003).However, under the condition of limited water supply, higher benefits may be achieved by adopting suitable irrigation interval and planting techniques (Sharma *et al.,* 2002).

Garden cress is an easily grown plant with few requirements both in temperate and tropical conditions. Seeds are sown by randomly scattering or placing them in row (broadcasting or drilling methods). The rows of the planting should be placed 7 – 10cm apart. Once the plant emerges, it is best to thin them 20 – 30cm apart. Re-sowing every two weeks will ensure a continual supply of the fresh greens (Allan and Dan frost, 2010).

Nitrogen (N) is directly involved in phosphorus (P) uptake and metabolism as such the amount of N required by the plant depends to some extent on the level of phosphorus (Ahmad and Tulloick, 1968). Lohard and Bory (1988) reported that NPK application increase maximum leaf area and duration. They also found out that leaf senescence was markedly higher when no NPK was applied. Mineral fertilizers used for green leaf vegetables are recommended to be fairly high in N, moderate in P and moderate to high in potassium (K) (Martins and Ruberte, 1979).

There are only few research works on the nutritional requirements, sowing method and irrigation water requirements of the crop in Samaru-Zaria .Therefore, farmers apply fertilizer and irrigation water at their discretion, thereby, over dosing the plant, which in turn results to poor yield at harvest. Similarly, the most appropriate sowing method that will produce the best yield with the use of minimum input is yet to be known by farmers in this location.

Therefore, it is in view of the above reasons that this research was conceived in order to determine the most appropriate rate of NPK fertilizer, sowing method and irrigation interval for better growth and yield of garden cress in Northern Guinea Savannah.

MATERIALS AND METHODS

Field experiment was conducted in 2015 and 2016 dry seasons at Samaru College of Agriculture students demonstration field in Northern Guinea Savanna ecological zone of Nigeria ($11^0$11'N,$07^0$38'E and 686m above sea level). The treatments consisted of three factors: NPK fertilizer rates (NPK 0: 0: 0 kg ha^{-1}, NPK 30: 30: 30 kg ha^{-1} and NPK 60: 60: 60 kg ha^{-1}); sowing methods (broadcasting and drilling) and irrigation intervals (3 and 5 days). The treatments were laid down in a Randomized Complete Block Design (RCBD) replicated three times given a total number of 36 treatments combination. The gross and net plot sizes were 1m × 1m and 0.5m× 0.5m respectively. Data were collected on plant height, number of leaves, number of branches and vegetable yield at harvest. Analysis of variance was used to analyse the data collected on growth and yield parameters. Where significant difference exists Duncan's Multiple Range Test was used to separate the means at 5% probability level.

RESULTS

Physical and Chemical Properties of the Soils of the two Experimental Sites

The physical and chemical properties of the soil of the two experimental sites are presented in Table 1.The results show that the textural class of the soil is sandy loam with organic carbon of 0.72% and 1.460 % and total nitrogen % of 0.280 and 0.280 in 2015 & 2016 respectively. Available P is 17.45 mg/100g in 2016 while in 2015 the available P is 4.38 mg/100g. Cation exchange capacity in 2016 soil is slightly higher (9.60 meq/100g) than 2015 soils (3.70 meq/100g). The soils in both years were not deficient in calcium, but, were slightly acidic.

Table 1: Physical and chemical properties of soils of the experimental site in 2015 and 2016

Composition	2015	2016
Physical properties		
Sand (%)	60	52
Silt (%)	20	28
Clay (%)	20	20
Textural class	Sandy loam	Sandy loam
Chemical properties		
pH in H_2o (1:2:5)	6.85	6.50
Organic Carbon (%)	0.72	1.460
Total N (%)	0.280	0.280
Available P (mg/kg)	4.38	17.45
Exchangeable Cation (Meq/100g)		
K	0.19	0.86
Na	0.64	0.43
Ca	1.72	4.5
Mg	0.34	1.36
CEC	3.70	9.60

Source: Department of Soil Science Ahmadu Bello University, Zaria

Effect of Sowing Methods, Irrigation Interval and Fertilizer Rates on Growth and Vegetable Yield of Garden Cress

Table 2 indicate that in 2015, sowing garden cress by drilling method significantly led to the production of more number of leaves, more number of branches in 2015 and vegetable yield at harvest in both years than by broadcasting method. Supplying irrigation water at 3 days interval significantly led to the production of taller plants in 2015, more number of leaves in 2016 and more vegetable yield in both years than at 5 days.
Application of NPK 60: 60: 60 kg ha^{-1}significantly recorded highest values for plant height, number of leaves, number of branches and vegetable yield at harvest followed by application of NPK 30: 30: 30 kg ha^{-1}, while the control recorded the least values.

In 2016, plot grown to drilling method of sowing significantly produced more vegetable yield at harvest only than broadcasting method of sowing. Likewise, the use of irrigation at an interval of 3 days significantly recorded higher values for number of leaves and vegetable yield alone than 5 days irrigation interval. NPK 60: 60: 60 kg ha^{-1}

significantly recorded the highest values for plant height, number of leaves and vegetable yield only. While the control treatment recorded the least values. However, application of NPK at varying rates did not have any significant effect on number of branches.

Table 2: Effect of sowing methods, irrigation interval and fertilizer rate on growth and vegetable yield of garden cress during 2015 and 2016 dry season at Samaru

Treatments	2015				2016			
	PH	NL	NB	VY	PH	NL	NB	VY
Sowing methods (S)								
Drilling methods	24.41	39.83[a]	9.54[a]	135.52[a]	15.57	38.22	8.40	267.04[a]
Broadcasting methods	20.55	25.38[b]	7.38[b]	94.62[b]	15.30	38.88	8.43	192.21[b]
SE±	1.359	2.539	0.646	8.604	0.322	0.628	0.322	10.890
Irrigation interval (I)								
3 days interval	26.54[a]	34.55	9.30	128.74[a]	15.71	39.98[a]	8.53	300.03[a]
5 days interval	18.42[b]	30.67	7.61	101.39[b]	15.56	37.12b	8.30	159.22[b]
SE±	1.359	2.538	0.646	8.604	0.322	0.628	0.322	10.890
Fertilizer rates (F)								
NPK 0:0:0	9.88[c]	19.55b	4.73[b]	45.34[c]	14.26b	34.03[b]	8.63	54.17[c]
NPK 30:30:30	19.97[b]	28.37[b]	6.54[b]	117.98[b]	16.28[a]	41.28[a]	8.61	214.81[b]
NPK 60:60:60	37.61[a]	49.90[a]	14.10[a]	181.88[a]	15.75[a]	40.33[a]	8.00	419.90[a]
SE±	1.665	3.109	0.791	10.538	0.395	0.769	0.290	13.337

PH = plant height; NL = number of leaves; NB = number of branches; VY = vegetable yield
Means followed by the same letter (s) within treatment group are statistically the same using DMRT at 5% level of probability.

DISCUSSION

Sowing garden cress using drilling method significantly resulted in production of more number of leaves, more number of branches and more vegetable yield at harvest. This tremendous yield could be as a result of deep sowing in drilling method, which enhanced the seed germination more than the broadcast method. Moreover, drilled seeds utilized the available moisture in the soil which in turn, facilitates water absorption rate by the seeds, which later translate to early emergence of the crop thereby giving it an edge over the broadcast seeds. Mary *et al.* (2014) reported that planting *Solanum macrocarpon* and *Solanum scabrum by drilling* method was more beneficial to the crop in terms of fertilizer application, weeding, pest control, water application and harvesting compared with sowing by broadcasting method.

Application of irrigation water at the interval of 3 days in 2015 and 2016 trials significantly recorded higher values for vegetable yield compared to irrigation interval of 5 days. Likewise, supplying irrigation water at the interval of 3 days significantly produced taller plants in 2015 and higher number of leaves in 2016. The reason for these variations in the response of parameters to irrigation interval at different years could be due to the fact that, irrigation deficit used in the location was insignificant and probably, the

evapotranspiration activities of the crop at that time of the year was not adequate for the crop to manifest moisture stress throughout the trials period.

Razmjoo *et al.* (2008) reported that limited water supply is the major environmental constraint in productivity of crop and medicinal plants. Moisture deficiency induces various physiological and metabolic response like stomata closure, decline in growth rate and photosynthesis (Flexas and Medrano, 2002).

The values for number of leaves, number of branches, plant height and vegetable yield were significantly higher when NPK 60: 60: 60 kg ha^{-1} was applied in both years. Jibrin (2013) reported that plant height, number of leaves/plant, vegetable yield and total dry matter where significantly higher at the application rate of 60kg N ha^{-1}.

CONCLUSION

Based on the findings of this study, it can be concluded that, for better performance, garden cress should be drilled, fertilized with NPK at the rate of 60: 60: 60 kg $ha^{-1}$and irrigated at 3 days interval.

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