Progressive Research 9 (1) : 66-69 (2014) *Society for Sci. Dev. in Agric. and Tech.*

EFFECT OF MOISTURE REGIME AND INTEGRATED NUTRIENT SUPPLY ON WHEAT (*Triticum aestivum* L.)

Vishuddha Nand[1] and Mahipal Singh[2]

[1]*Narendra Dev University of Agriculture and Technology, Kumarganj, Faizabad-224, 229 (U.P.)*

[2]*Janta College Bakewar,Etawah-(UP)-206124*

E-mail: vishuddhanand84@gmail.com

ABSTRACT

The present investigation was conducted at Agronomy research Farm of Narendra Deva University of Agriculture and Technology, (Kumarganj), Faizabad (U.P), during winter season 2008-09. The experimental results revealed that all the growth parameters like plant height (54.5) cm, number of shoots (432.8) per m^2, leaf area index (3.87), dry matter accumulation (364.0) g/m^2 at 60 DAS were significantly higher under five irrigations at CRI, maximum tillering, late jointing, flowering and milking stage with 100% NPK through inorganic fertilizers (120:60:40) then 75% NPK + 25% Nitrogen through FYM and 75% NPK+ Azotobactor and at par with IW/CPE ratio=1.0 with 75% NPK + 25% Nitrogen through Bio-compost. The yield attributes and yield were significantly increased also same treatments. The highest total N uptake was calculated under five irrigations at critical stages followed by IW/CPE ratio=1.0 which was significantly higher over the IW/CPE ratio= 0.8 and three irrigations at CRI, late jointing and milking stages. Maximum and minimum water use efficiency (207.68 kg/ ha-cm) and (139.47 kg/ha-cm) was worked out under IW/CPE=0.8 ratio and 5 irrigations at CRI, maximum tillering, late jointing, flowering and milking stage, respectively.

Key Word : *Moisture regime, FYM, bio-compost, NPK and azotobactor.*

Wheat (*Triticum aestivum* L.) is the single most important cereal crop that has been considered as integral component of food security system of several nations. It rank first in the world among the cereal both in respect of acreage 215.61 m ha and production 630 mt. Wheat is a major stable food crop after rice in south East Asia. The wheat acreage in south Asia is more than 36 million ha which is around 16 per cent of global wheat area and production is around 95 million tonnes which is around 15 per cent of Worlds wheat (1). In India total area under wheat is 27.8 mha with the total production of 80.58 mt and productivity of 2.9 tonnes/ha. Uttar Pradesh rank first in respect of area and production which is about 9.13 mha with the total production 24.57 mt and productivity (26.91) q/ha respectively, and an average productivity much lower than that of Punjab and Haryana. Out of the total wheat area in India about 85.2 per cent is irrigated. Area under late sown wheat is increasing years after year occupying more than 50 per cent of total wheat irrigated area. At present irrigation is very costly input so will be used very judiciously with IW/CPE ratio basis or critical stages.

All though increasing level of production can be achieved by increasing use of fertilizer, but continues use of chemical fertilizer along may lead to diminishable yield even with the recommended dose of fertilizer application. Yield potential of crop has reached a plateau as a result of deterioration of soil health in terms of depletion of organic matter and nutrients. Besides chemical fertilizer along may also lead to same detrimental effect on physical and chemical properties of soil and may not be so remunerable unless the fertility of soil is maintained and sustainable level by the application of organic manures. Therefore maintain fertility and productivity of soil at sustainable level for long duration, there is needed to adopt the concept of integrated nutrient management.

MATERIALS AND MATHODS

The experiment was conducted at Agronomy Research Farm of Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad, Raibareily road at the distance of 42 km from Faizabad district during the winter season 2008-09. Geographically this

experimental site falls under sub humid, sub tropical climate of Indo- Gangatic alluvial plains (IGP) having alluvial calcareous soil and is located at 260 47 N latitude and 820 12 E longitude on an elevation of about 113 meter above mean sea level. The weekly mean minimum and maximum temperatures during the crop season ranged from 5.6 to 23.8 and 18.9 to 42.00 C, total rainfall received was 12.6 mm during the entire crop season. The experimental field was well drained and leveled. The sample were taken with augor from 0-30 cm depth in field were collected randomly. The treatments were considered four and irrigation levels (I_1-IW/CPE=0.8, I_2-I W/CPE ratio=1.0, I_3-three irrigation at CRI, late jointing, milking stage and I_4-five irrigation at CRI, maximum tillering, late jointing, flowering and milking stage as main plot treatments and four integrated nutrient supply sources viz., F_1-100% NPK through inorganic fertilizers (120:60:40 kg/ha), F_2-75% NPK + 25% Nitrogen through FYM, F_3-75% NPK + 25% Nitrogen through Bio-compost and F_4-75% NPK + Azotobactor as sub plot treatments. Sixteen treatment combinations were replicated four times. The soil of experimental site was silt loam and texture with low organic carbon (0.38%) and nitrogen (198.0 kg/ha) medium in phosphorus (18.86 kg/ha) and potassium (284.30 kg/ha). The wheat cv Malviya 234 was sown at proper moisture on 26 December, 2008. Sowing was done in row 22.5 cm apart and 4-5 cm deep in furrows opened by plough. Certified seed was used @ 125 kg/ha in all the plots. Irrigation which applied in the 4th treatment in first two treatments irrigations was applied on the basis of IW/CPE ratio (IW/CPE = 0.8 and 1.0) respectively, the formula of IW/CPE ratio given below.

$$\text{IW/CPE} = \frac{\text{Irrigation water depth (mm)}}{\text{Cumulative pen evaporation (mm)}}$$

Irrigation where given as above treatment. Which were worked out on the basis of formula given?

$$t = \frac{ad}{q}$$

Where,

t = time of application of water

a = area of plot to be irrigated m^2

d = depth of water to be provided m^2

q = discharge m^3/ second measured with the help of parshall flume which was installed in irrigation channel and in rest two treatments, irrigation were applied at CRI stage, late jointing and milking stage in first treatment. In second treatment irrigation were applied at CRI stage, max tillering stage, late jointing stage, flowering stage and milking stage.

RESULTS AND DISCUSSION

All the growth parameters showed the (Table-1). The maximum plant height (54.5) cm, number of shoots (432.8) per m^2, leaf area index (3.87), dry matter accumulation (364.0) g/m^2 at 60th DAS were significantly affected by five irrigations at CRI, maximum tillering, late jointing, flowering and milking stage over the IW/CPE=0.8 ratio and three irrigations at CRI, late jointing, milking stage and at par with IW/CPE=1.0 ratio. The maximum growth rate was observed at 60^{th} day stages indicating as grand growth period of the crop this might due to increased rate of light absorption high photosynthetic activities and increased absorption of nutrient from the soil, Rana and Bana (2012). The growth parameters were also affected by integrated nutrient supply sources (Table-1). The maximum plant height (49.4) cm, number of shoots (377.5) m^2, dry matter accumulation (322.7), and leaf area index (3.50) were significantly obtain under 100% NPK through inorganic fertilizer (120:60:40 kg/ha) than F_2 and F_4 treatments and at par with 75% NPK and 25% N through Bio-compost. It might be due to adequate supply of nutrients favoured the nutrient uptake and nutrient utilization towards protein which favoured vertical and lateral growth of the plant ultimately increased have been reported by (2).

Yield attributes, which determined yield, is the resultant of the vegetative development of the crop. All the attributes of yield viz., effective shoots/m^2, number of spikelets/spike,length of spike, and number of grains/spike influenced significantly due to various moisture regimes (Table-1). The maximum effective shoots (390)/m^2, number of spikelets/spike (13.5), length of spike (8.4) cm and number of grains (39.5)/ spike were obtain under (I_4) treatments which significantly higher over the IW/CPE=0.8 ratio (I_1) and three irrigations at CRI, late jointing, milking stage and at par with IW/CPE=1.0 ratio (I_2) Thus, under wettest

Table-1 : Growth parameters, yield attributes, grain yield, total N uptake and water use efficiency of wheat as influenced by moisture regime and integrated nutrient supply sources.

Treatments	Growth parameters				Yield attributes characters				Grain yield (q/ha)	Total N uptake (kg/ha)	Water use efficiency
	plant height (cm) at 60 DAS	No of shoots/m^2 at 60 DAS	Dry matter accumulation (g/m^2) at 60 DAS	LAI at 60 DAS	No of effective shoots/m^2	No of spikelets/ spike	Length of spike (cm)	No. of grains /spike			
Moisture regime											
I_1	49.9	379.8	338.4	3.55	350.0	12.1	7.5	35.5	40.0	96.1	207.08
I_2	52.5	413.9	340.0	3.72	376.0	13.0	8.1	38.1	42.7	102.6	169.04
I_3	48.9	378.9	319.3	3.47	343.0	11.9	7.4	34.7	39.7	95.1	206.12
I_4	54.5	432.8	364.0	3.87	390.0	13.5	8.4	39.5	43.6	104.7	139.47
SEm±	1.2	6.4	9.1	0.09	9.6	0.3	0.20	1.0	0.72	1.8	5.6
CD (P= 0.05)	4.0	20.6	29.1	NS	30.8	1.0	0.66	3.2	2.3	5.7	16.2
Integrated nutrient supply sources											
F_1	54.0	424.6	356.8	3.84	383.2	13.4	8.3	39.2	46.3	113.6	194.86
F_2	50.4	396.8	331.1	3.58	357.0	12.4	7.7	36.2	40.5	95.9	170.45
F_3	52.0	406.5	350.9	3.69	369.0	12.8	7.9	37.3	42.9	103.3	180.55
F_4	49.4	377.5	322.7	3.50	350.0	12.0	7.5	35.1	36.3	85.7	152.77
SEm±	1.0	6.2	7.9	0.08	8.1	0.30	0.18	0.8	1.7	4.6	4.2
CD (P = 0.05)	2.9	17.9	22.6	0.23	23.2	0.85	0.53	2.4	5.0	13.2	11.8

moisture level five irrigations prominent favourable vegetative growth and development occurred because it received adequate moisture. The lowest yield attributes were recorded under three irrigations at CRI, late jointing, milking stage because crop was unable to extract more water and nutrients under moisture, deficit condition which resulted poor growth and yield attributes. This result is in close proximity to those obtained by (3). The yield attributes viz effective shoots/m^2, number of spikelets spike/,length of spike and number of grains/spike significantly influence by integrated nutrient supply sources. Maximum yield attributes recorded under 100% NPK through inorganic fertilizers (120:60:40 kg/ha) followed by (F_3) and significantly higher over the (F_2) and (F_4) treatments, respectively which might be due to plants uptake higher quantities of npk from the soil these result revealed by (4).

Yield is the result of coordinated inter play of growth characters and yield attributes. Grain yield significantly influenced by different moisture regimes (Table-1). Highest grain yield (43.6 q/ha) was recorded under five irrigations at critical stages. This might be due to adequate moisture availability, better vegetative growth coupled with higher yield attributes resulted in higher grain yield .Three irrigations at CRI, late jointing, milking stage recorded lowest grain yield (39.7 q/ha) due to poor moisture supply during growth period. Poor moisture supply during critical stages reduced the yield attributes and resulted in poor grain yield .Similar findings were reported by (5). The maximum grain yield (46.3 q/ha) was recorded with 100% NPK through chemical fertilizer i.e. 46.3 q/ha which was 7.34, 12.52, and 21.5% higher over 75% NPK + 25% Nitrogen through bio-compost, 75%NPK + 25% nitrogen through FYM and 75% + 25% NPK + Azotobacter respectively, the yield influents significantly due to various moisture regimes. Thus under wettest moisture regimes at five irrigations prominent favourable vegetative growth and development occurred because it received adequate moisture this result is in close proximity to those obtained by (3).

The total N uptake (104.7 kg/ha) was recorded under five irrigations at CRI, maximum tillering, late jointing, flowering and milking stage which was at par

with (102.6 kg/ha) IW/CPE=1.0 ratio and significantly higher over 96.1 kg/ha (I_1) and 95.1 kg/ha (I_3) treatments, respectively. Adequate moisture in root zone increase the movement of nutrient in soil solution, ultimately their absorption by the growing plants significantly lower uptake of N, P and K was recorded under (I_3) treatments. This could be due to lower moisture content responsible for decreased nutrient solubility, result in poor plant growth and reduced N, P and K uptake similar results reported Waraich et al. (2010). The total N uptake significantly higher influenced by integrated nutrient supply sources (Table-1). The highest total N uptake (113.6 kg/ha) was recorded under (F_1) 100% NPK through inorganic fertilizers (120:60:40 kg/ha) and minimum total N uptake (85.7 kg/ha) were also recorded with (F_4) 100% NPK+ Azotobactor. The nutrient might be due to released with much slower rate from organic sources while the inorganic fertilizers released the nutrient immediately. (7).

The maximum water use efficiency 207.68 kg-1-cm was work out under 0.8, IW/CPE ratio fallowed by three irrigations at CRI, late jointing and milking stage i.e., 206.12 kg/ha-cm. Crop with irrigations were provided with adequate moisture to meet their various requirements, which result increased plant growth. Nutrients applied through inorganic fertilizers favoured the growth of plants as they consumed more amount of water for their metabolic processes and transpiration more value due to water, plant growth which led to higher WUE. These results have been reported by (8).

REFERENCES

1. FAO-(2007-08). Annual Report.
2. Singh; R.K.; Kumar, Sandeep and Singh, L.B. (2007). Integrated nutrient management in wheat (*T. aestivum* L.). *Indian J. Agron. 52 (2) :* 124-126.
3. Saren, B.K.; Dey's and Mandal, D. (2004). Effect of irrigation and sulphur on yield attributes, productivity, consumptive use, consumptive use efficiency of wheat (*T. aestivum* L.). *Indian J. Agric. Sci., 74 (5):* 257-261.
4. Pandey, I.B.; Dwidedi, D.K. and Pandey, R.K. (2009). Integratet nutriet management for sustaining wheat (*Triticum aestivum* L.) production under late sown condition. *Indian J. Agron., 54 (3) :* 306-309.
5. Meena, Sewha; Phogat, V.K.; Hooda, I. S. Dhindwal, A. S. and Uma Devi (2010). Nutrient uptake by wheat as influenced by planting methods and moisture regimes. *Annals of Biology 26 (1) :* 49-53.
6. Waraich, E.A.; Ahmad, R.; Saifullah Shamim Ahmad and Ahmad, A. (2010). Impact of water and nutrient management on the nutritional quality of wheat. *Journal of Plant Nutrition. 33 (5):* 640-653.
7. Khalid, Nawab; Amanullah, Paigham Shah; Abdur, Rab Muhammad and Arif Khan, M. A. (2011). Impact of integrated nutrient management on growth and grain yield of wheat under irrigated cropping system. *Abdul Mateen Fazal Munsif Pakistan Journal of Botany; 43 (4) :* 1943-1947.
8. Gorny, A.G.; Banaszak, Z.; Lugowska, B. and Ratajczak, D. (2011). Inheritance of the efficiency of nitrogen uptake and utilization in winter wheat (*Triticum aestivum* L.) under diverse nutrition levels. *Euphytica. 177 (2):* 191-206.