

Studies on Direct and Residual Effect of Organic + Inorganic Sources of Nitrogen in Wheat (*Triticum aestivum* L.) – Forage Cowpea (*Vigna unguiculata* L.) Cropping System

P.K.Suryawanshi*, V.D.Pagar¹, J.P.Patil and S.V.Ahire

B.A.College of Agriculture, Anand Agricultural University, Anand (Guj.) 388 110

*Correspondence Email :Panksurya0923@gmail.com

ABSTRACT

75% RDN + 25% RDN from FYM produced higher growth, yield attributing characters, grain yield (3,716 kg ha⁻¹) and net returns (Rs. 29,304ha⁻¹) while, application of 100% RDN (120 kg N) produced higher straw yield (7771 kg ha⁻¹) of wheat. Seed inoculation with *Azotobacter chroococum* and *Azospirillum lipoferum* maximize the yield of wheat (3,328 kg ha⁻¹) and secured higher net return (Rs. 21,932 ha⁻¹). However, green fodder (275 q ha⁻¹), dry matter yield of succeeding forage cowpea (66 q ha⁻¹) were significantly influenced by residual effect of treatment 25% RDN + 25% from FYM + 25% from VC + 25% from CC. *Azotobacter* + *Azospirillum* inoculation treatment were maximize green fodder 250 and dry fodder yield 60 q ha⁻¹ of wheat-forage cowpea sequence

Key words : Organic, Inorganic, Nitrogen Wheat and forage cowpea

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INTRODUCTION

Wheat (*Triticum aestivum* L.) is an important cereal crop of a large number of countries in the world and provides about 20% of total food calories for the human race [2]. In India, Gujarat ranks sixth in wheat production and the area under wheat crop. Gujarat is about 12.50lakh hectares with total production of 29.07 lakh tones [1]. An adequate and optimum supply of nitrogen is required for vegetative growth and for maintaining genetical potential while, the deficit and excess reduce the production potential of crop. The supplementary and complementary use of organic manures viz., FYM, vermicompost, castor cake and inorganic fertilizers plays an important role in the growth and development of crop [7]. Non-symbiotic bacteria like *Azotobacter* and *Azospirillum* are potential bio-fertilizers capable of contributing nitrogen to a number of non-legume crops by trapping aerial reservoir [4]. The integrated approach of nutrient supply by using organic, inorganic and bio-fertilizers is gaining importance, because this system not only reduces the use of costly inorganic fertilizers, but also it is an eco-friendly approach [5]. The application of organic manures may serve as excellent source of macro and micro nutrients [3].

The package of practices so far generated on fodder cowpea is for getting maximum green and dry fodder production during lean period of the summer season.

MATERIAL AND METHODS

Experimental site : A field experiment was carried out at the College Agronomy Farm, B. A. College of Agriculture, Anand Agricultural University, Anand, Gujarat during *rabi* and

summer seasons of the years 2011-12 and 2012-13 on Plot No. A-33 with succeeding forage cowpea taken after main crop of wheat on the same plot.

Physico-chemical properties Soil :Composite soil samples were collected from the experimental site up to the depth of 0-15 cm and 15-30 cm before commencement of the experiment and were analyzed for the various physico-chemical properties. The soil of experimental site was sandy loam with 7.5 pH, organic carbon 0.38 %, EC 26 dsm⁻¹, available N 199.5 kg ha⁻¹, P₂O₅ 32.17 kg ha⁻¹ and high K₂O of 389.00 kg ha⁻¹.

Varietal description

Wheat

The wheat variety GW-366 used in the present investigation was released by Wheat Research Station, Junagadh Agricultural University, Junagadh (Gujarat) during the year 2006.

Cowpea: EC-4216

The variety EC-4216 is the most promising variety of fodder cowpea. It is mid duration variety, produces about 30 to 35 t ha⁻¹ green fodder. It is recommended for the Northern, Western and Central India.

Treatment details

Twenty one treatment combinations comprised of seven N management through chemical fertilizer and manures (F) viz., F1: 100 % RDN (from chemical fertilizer), F2: 75 % RDN + 25 % RDN from FYM, F3: 75 % RDN + 25 % RDN from Vermicompost, F4: 75 % RDN + 25 % RDN from Castor cake, F5: 50 % RDN + 25 % RDN from FYM + 25 % RDN from Vermicompost, F6: 50 % RDN + 25 % RDN from FYM + 25 % RDN from Castor cake and F7: 25 % RDN + 25 % RDN from FYM + 25 % RDN from Vermicompost + 25 % RDN from Castor cake and three levels of Bio-fertilizer inoculation (B) B1: No bio-fertilizer inoculation, B2: *Azotobacter chroococcum* inoculation, B3: *Azotobacter chroococcum*+ *Azospirillum lipoferum* inoculation, recommended dose of P₂O₅ 60 kg ha⁻¹ in the form of Single Superphosphate was applied as basal at the time of sowing of wheat crop. No fertilizer was given to succeeding forage cowpea. The experiment was laid out in FRBD with three replication.

RESULTS AND DISCUSSION

Observation on Grain yield and straw yield of wheat were recorded at harvest of wheat and Green fodder yield and dry fodder yield of forage cowpea observation were taken at harvest of cowpea. Net return were calculated on the basis of both crop yields.

Table 1: Effect of INM and Bio-fertilizer levels on of wheat – forage cowpea sequence (Pooled value of 2 years)

Treatments	Grain yield (kg ha ⁻¹)	Straw yield (kg ha ⁻¹)	Net return (Rs. ha ⁻¹)	Green fodder yield (q ha ⁻¹)	Dry fodder yield (q ha ⁻¹)
Nitrogen management (F)					
F ₁ :	3578	7771	26799	204	49
F ₂ :	3716	7610	29304	249	60
F ₃ :	3568	7133	26173	235	57
F ₄ :	3378	6742	20840	211	51
F ₅ :	2723	6534	13909	259	62
F ₆ :	2582	6567	10700	249	60
F ₇ :	2624	5514	10220	275	66
S.Em. ±	71	226	-	12.81	3.09
C.D. (P=0.05)	200	783	-	NS	NS
Bio-fertilizer inoculation (B)					
B ₁ :	3031	6551	17792	3031	6551
B ₂ :	3142	6953	19394	3142	6953
B ₃ :	3328	7013	21932	3328	7013
S.Em. ±	47	86	-	47	86
C.D. (P=0.05)	131	243	-	131	243
F x B	NS	NS	-	NS	NS

Nitrogen management

Application of (F₂)75% RDN + 25% RDN from FYM when applied to the wheat crop it produced higher growth, yield attributing characters it is positively increased grain yield (3,716 kg ha⁻¹) and ultimately net returns (Rs. 29,304ha⁻¹) while, application of 100% RDN (120 kg N) produced higher straw yield (7771 kg ha⁻¹) of wheat, it might be due to an adequate and optimum supply of nitrogen through chemical supply the Nitrogen to crop easily available when crop required..

Biofertilizer inoculation

Seed inoculation with (T₃) *Azotobacter chroococum* and *Azospirillum lipoferum* maximize the growth, yield attributing characters, yields of wheat (3,328 kg ha⁻¹) and secured higher net return (Rs. 21,932 ha⁻¹) Kachroo, and Ravinder [3]. However, green fodder (275 q ha⁻¹), dry matter yield of succeeding forage cowpea (66 q ha⁻¹) were significantly influenced by residual effect of treatment 25% RDN + 25% from FYM + 25% from VC + 25% from CC. *Azotobacter* + *Azospirillum* inoculation treatment were maximize green fodder 250 and dry fodder yield 60 q ha⁻¹ of wheat-forage cowpea sequence [6].

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