INFLUENCE OF JINONG (ORGANIC LIQUID FERTILIZER) ON SEEDLING GERMINATION AND GROWTH AND ITS COMPARISION WITH BIO-FERTILIZER ON YIELD OF BREAD WHEAT (TRITICUM AESTIVUM L.)

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ABSTRACT

In the experiment performed during Nov. 2009 to April 2011 at Christ Church College, Kanpur on influence of Jinong [Organic liquid fertilizer whose main constituent is humic acid] on seedling germination and growth and its comparision with Bio-fertilizer (Azotobacter sps.) and farmyard manure alone or in combination on yield of Bread Wheat [triticum aestivum L].variety [(K-9107 (Deva)]: The treatments of Jinong except 0.5% promoted germination percentage in Triticum aestivum L. The effect in increasing germination was observed with 0.2%. Jinong. All treatments except 0.5% Jinong increase shoot length ,root length,lateral root number and dry weight of seedling the increase was maximum with 0.2% Jinong as compared to control. Based on experiments on seedling growth 0.2% Jinong and 0.3% Jinong gave better result these were used for combined treatments with Bio-fertilizer / farmyard manure. the new humic acid containing organic fertilizer Jinong was far more effective than Bio-fertilizer and Farmyard manure applied alone or in combination in enhancement of grain number on main shoot, grain number / plant, grain weight of 100 seeds, grain weight / plant, straw weight / plant and harvest index. Among all applications 0.2% Jinong + Farmyard induced the best effects. When combination of Bio-fertilizer, Jinong and Farmyard manure were applied together there was a tremendous fall in the values of yield

Keywords: Biofertilizer (Azotobacter Sps.), Farmyard Manure, Jinong, Organic Liquid Fertilizer Triticum Aestivum L.

I. INTRODUCTION

Wheat cereal grass of the genus *Triticum*, family Poaceae is one of the oldest and most important of cereal crops. Globally wheat is the leading source of vegetable protein in human food, having a higher protein content than either maize or rice. Wheat grain is a staple food used to make flour for bread, biscuits, cookies, cakes, pasta, noodles and for fermentation to make beer other alcoholic beverages (Neill, 2002) [1] or biofuel (Department of Agriculture Appropriations, 1957). Wheat is planted for use as forage for livestock. Its straw can be used as construction material for roofing thatch (Bridgwater and Aldrich, 1966).[2] The embryo is rich is carbohydrate, Ca, Fe, K, P, Zn. An increasing realization in human population all over the world, the need of consumption of wheat after rice has importance. To meet out the requirement effort is being made of how to increase crop productivity per unit area, per unit time so that demand of its supply be increased. Increasing

wheat production is an essential global and national target to fill the gap between production and consumption.

In a bid to increase food crop excessive farming is done. Fertility of soils has been declining due to extensive use of land and chemical fertilizers in quest of producing more food for ever increasing population. The organic content of most soils is below the critical level. Extensive use of chemical fertilizers has been inflicting adverse effect on the environment causing pollution and damaging beneficial soil flora and fauna, causing erosion and lower crop quality (Kumar *et al.,* 2001) [3]. Experiencing the adverse effects of synthetic input dependent agriculture the concept of organic agriculture is gaining momentum. Almost 31 million hectares of land are currently managed organically and constitute 0.7% of agricultural land. Of the total cultivable area in India 70% of the land which is mainly rainfed, a very negligible amount of chemical fertilizer is being used. Farmers in these areas often use organic manures.

India has tremendous potential to grow crops organically (Maity *et al.,* 2004) [4]. Application of organic manures or biofertilizers is the only option to improve soil organic carbon for sustenance of soil quality and future agricultural productivity (Ramesh, 2008) [5].

Jinong, recommended by China Green Food Development Center, Under the Agricultural Ministry, Govt. of China (www. cfcl_india.com /jinong-haolf.html) is an organic liquid fertilizer, whose main constituent is humic acid {65.54 g/l } Humic acid fertilizer is the essence of farm manure, its effect on increasing crop yield is more significant than chemical fertilizer and manure. It has been further observed that the NPK(20.58 g/l of N; 23.69 g/l of P; 21.67 g/l of K) and trace elements(2.03 g/l of Cu + Fe + Zn + Mo + Mn + B) present along with humic acid in Jinong are ideal for any plant growth. The humic substance have multiple effects (Sangeetha *et al.,* 2006) [6]. It may have direct and indirect effects on plant growth (Chen and Aviad, 1990) [7]. Indirect effects involve improvement of soil properties such as aggregation, aeration, permeability, water holding capacity, micronutrient transport and availability. Direct effects are those which require uptake of humic substance into the plant tissue resulting in various biochemical effects (Chen and Aviad, 1990) [7]. Consequently the use of humic substance has often been proposed as a method to improve crop food (Adani *et al.* 1998) [8]. Singer *et al.* (1998) [9] found that application of Delta mix (a fertilizer containing humic acid substance with micronutrients B, Zn, S, Mn, Fe and Cu) enhanced the growth with food quality of common bean.. The micronutrients thus, made available to plants play an important role in increasing crop yield and straw yield in wheat (Asad and Rafique 2000 [10]; Hussain *et al.*, 2002) [11].

Sharif *et al.* (2002) [12] found the addition of 0.5 – 1.0 kg/ha humic acid resulted in increased wheat grain yield by 25-69% over control. It was observed that pretreatment of seeds + foliar sprays of humic acid increased yield and yield components in *Phaseolus vulgaris* L. as also observed with humic acid containing Jinong in the present study. Delfine *et al.*, 2005[13] has concluded that humic acid as foliar sprays enhanced yield and growth in plants. For yield parameters grain number on main shoot, grain number / plant, dry weight of 100 seeds, dry grain weight / plant, straw weight and harvest index can be studied.

the objectives of this Study Was To determine the the variability effects of organic liquid fertilizer on wheat plant variety and to compare the effect of Biofertilizer used (*Azotobacter sps.*) with organic fertilizers including the newly marketed humic acid containing liquid organic fertilizer – Jinong on wheat yield.The goal was to minimizes the use of chemical fertilizers . Therefore in order to make agriculture sustainable, it is necessary to implement a balanced and responsible use of organic agriculture

II. MATERIALS AND METHODS

The seeds of *Triticum aestivum* L. var. K-9107 (Deva) were obtained from Chandra Shekhar Azad University of Agriculture and Technology, Kanpur.

2.1 Preparation of Biofertilizer

The Biofertilizer (*Azotobacter sp*) in packets of 200 g each were bought from the Microbiology Dept. of C.S.A. University, Kanpur.

2.2 Preparation of Farmyard Manure

Farmyard manure was bought from the local market.

2.3 Preparation of Solutions of Jinong

Jinong also called Zinong is an organic liquid fertilizer, manufactured by Yangling Techteam Jinong Humic Acid Products Co., Ltd. China was obtained from dealers of Elegant Fashion Fiber Chemicals Ltd.

For preparation of the experimental chemicals 0.5, 1.0, 2.0, 3.0, 4.0 and 5.0 c.c. Jinong was taken and made to 100 c.c. with distilled water in clean measuring flask and continued to 1000 ml for 0.5%, 0.1%, 0.2%, 0.3%, 0.4% and 0.5% solutions.

In order to find the most suitable concentration of Jinong i,e 0.05%, 0.1%, 0.2%, 0.3%, 0.4%, and 0.5% preliminary experiments were conducted under controlled laboratory conditions in the Department of Botany, Christ Chruch College. The experiments on seed germination and seedling growth were conducted by Garrad's Technique (1954) [14] in test tube. For Garrad's technique seeds were placed in test tubes between blotting paper and wall of the tubes. The level of water and experimental solutions of 0.05%, 0.1%, 0.2%, 0.3%, 0.4%, 0.5% Jinong were made upto the marked level every alternate day

2.4 Treatment of Biofertilizer

The Biofertilizer *Azotobacter* was applied as soil treatment. For this soil was mixed with *Azotobacter* powder as 50 mg for 10 kg soil as recommended. In preliminary experiments soils treatment and seed treatment were compared. For seed treatment two kg wheat grains were treated in a mixture of 40 g *Azotobacter* + 10 g Jaggery. However, soil treatment being more effective this was chosen as mode of application in the present study

2.5 Treatment of Farmyard manure

Two handful of manure was added per pot wherever it was considered as application.

2.6 Treatment of Jinong

Based on preliminary experiments and experiments on seedling growth 0.2% Jinong and 0.3% Jinong were applied alone or in combinations at soaking seed stage and three sprays at intervals of 14 days, the first spray being 20 DAS (days after sowing). (since 0.2% Jinong gave better result it was used for combined treatments with Biofertilizer / farmyard manure

2.7 Spraying of Experimental Jinong Solutions

Solutions were prepared as mentioned earlier. A few drops of teepol were added as wetting agent in each solution, followed by vigorous shaking. The solutions thus prepared were throughly sprayed on the plants with the help of a 600 ml hand sprayer. The spraying machine was thoroughly cleaned, rinsed several times with the solution intended to be sprayed next to avoid any admixture of the experimental solution.

The first treatment was done by seed soaking in the respective solutions. This was followed by the first spray 20 DAS. Two more sprays of the respective solutions were made at intervals of 14 days. Control plants were sprayed with distilled water having few drops of teepol. Plants in each pot (5 sample) were drenched with approx. 100 c.c. of solution, remaining falling to the soil.

2.8 Ten treatments were applied as follows:

1.	Control	6.	FYM
2.	Biofertilizer	7.	Biofertilizer + FYM
3.	0.2% Jinong	8.	0.2% Jinong + FYM
4.	0.3% Jinong	9.	0.3% Jinong + FYM
5.	Biofertilizer + 0.2% Jinong	10.	Biofertilizer + 0.2% J + FYM

2.9 Experimental Layout

For all experiments, earthenware pots (9") were arranged in randomized block design, having three blocks of two rows each. Two pots were randomly selected in each block for each treatment. Each pot had 5 plants growing in them. Two plants in each pot were tagged for regular observations.

III. RESULTS AND DISCUSSION

3.1 Germination Percentage

The treatments of Jinong (Table A) except 0.5% promoted germination percentage in *Triticum aestivum* L. The effect in increasing germination was observed with 0.2%. Jinong where the value was 98.33 percentage. However, 0.5% Jinong decreased germination percentage to 42.33.

3.2 Shoot Length

All treatments except 0.5% Jinong increase shoot length (Table A). The increase was maximum (16.33 cm) with 0.2% Jinong as compared to 11.16 cm in the control. With increase in concentration there was a decrease in shoot length and it was 10.16 cm (lesser than control) with 0.5% Jinong.

3.3 Root Length

Treatments of Jinong increased root length except with 0.5% concentration as compared to 10.67 cm in the control (Table B) the increase in length did not show any particular trend. It was 11.12 cm with 0.05%, 14.54 cm with 0.1%, 13.60 cm with 0.2%, 14.40 cm with 0.3%, 11.97 cm with 0.4% Jinong. However, with 0.5% concentration the root length decreased to 8.75 cm.

3.4 Lateral Root Number

Lateral root number increased with all treatments (Table B) except 0.5% Jinong as compared to 3.67 in the control. The root number was best (4.33) with 0.2% and 0.3% Jinong. Treatment of 0.1% and 0.4% induced less increase in lateral root number and it was 4.00.

3.5 Dry Weight of Seedlings

The dry weight of seedlings also increased with all treatments of Jinong except 0.05%, 0.4% and 0.5% concentrations (Table B). The increase was maximum 0.07 mg with 0.2% Jinong. With increase in dose to 0.3%, 0.4% promotion in seedling weight was lesser and was 0.06 and 0.04 mg. However, with 0.5% there was a decrease in dry weight to 0.2 mg as compared to 0.04 mg in the control Enhancement of grain number (Chart D) on main shoot, grain number / plant, grain weight of 100 seeds, grain weight / plant, straw weight / plant and

harvest index was also increased with the use of biofertilizer. The increase over control was 7.48%, 49.55%, 11.30%, 25.79%, 19.57% and 3.97%, respectively. Addition of Jinong to Biofertilizer improved the values and were 11.90%, 78.34%, 12.65%, 42.02%, 23.62% and 11.12%, respectively. Addition of Farmyard manure to Biofertilizer was less effective combination than Bf + 0.2% J and the readings were 9.50%, 54.66%, 13.92%, 35.36%, 12.93% and 14.66%, respectively.

When combination of Biofertilizer, Jinong and Farmyard manure were applied together there was a tremendous fall in the values and was 6.14%, 24.39%, 7.59%, 9.27%, 14.91% and -3.79%, respectively.

Astonishingly 0.2% Jinong, the newly available liquid organic fertilizer mainly containing humic acid applied alone was more effective than Biofertilizer. The percentage increase here was 14.70%, 87.40%, 18.99%, 54.78%, 25.86% and 16.84%, respectively.

Addition of Farmyard manure to this organic fertilizer further enhanced the values to maximum of 18.97%, 150.06%, 22.78%, 101.15%, 35.69% and 33.51%, respectively.

The benefits of humic substances are reflected in improved seed germination, root growth, uptake of minerals in plants and other physiological effects on plant growth and thus improve crop production (Adani *et al.*, 1998).

Literature supports increased growth parameters, yield and yield parameters in crops with Biofertilizers and organic fertilizers and even humic acid. However, there is a report on increased growth and yield in corn with the new humic acid containing product Jinong (Zeng and Luo, 2011) [15]. Sharif *et al.,* 2002 [12] found that addition of 0.5 to 1.0 kg / ha humic acid resulted in increased wheat grain yield by 25-69% over control. It was observed that pretreatment of seeds + foliar sprays of humic acid increased yield and yield components in *Phaseolus vulgaris* L. as also observed with humic acid containing Jinong in the present study. Delfine *et al.*, 2005[13] has concluded that humic acid as foliar sprays enhanced yield and growth in plants. The increase in growth with Jinong can be attributed to be due to presence humic acid which is the major component in addition to small proportions of macro and micronutrients especially Zn and Fe. Moreover wheat is rich in phytic acid and phenolic compounds that reduce biological availability of Zn and Fe in the human digestive tract (Welch and Graham, 2004) [16]. So sufficient amount of Fe and Zn should be available in the crops to overcome this problem. Therefore, the Fe and Zn content in grains of wheat due to treatments of Biofertilizer and especially Jinong can be considered a beneficial effect.

Humic acid are reported to enhance growth, drought tolerance, seed germination and overall performance (Chen and Aviad, 1990 [7]; Zhang *et al.*, 2003[17] as also observed in the present study.

IV. TABLE A EFFECT OF JINONG ON GERMINATION AND SHOOT LENGTH OF SEEDLINGS OF *TRITICUM AESTIVUM* L.

S.No.	Treatment	% of Germination		Shoot length (cm)	
	Control	83.33		11.16	
1	0.05% J	84.66	(1.60)	12.20	(9.32)
2	0.1% J	91.66	(9.99)	13.90	(24.55)
3	0.2% J	98.33	(18.00)	16.33	(46.32)
4	0.3% J	96.66	(15.99)	15.40	(37.99)
5	0.4% J	86.66	(3.99)	15.16	(35.84)
6	0.5% J	42.33	(-49.20)	10.16	(-8.96)

Data in parenthesis is % increase over control.

Table B Effect of Jinong on Root Length, Lateral Root Number, Seedling Dry Weight of Triticum Aestivum L

S.No.	Treatment	Root length (cm)		Lateral root number		Dry weight of seedling (mg)	
	Control	10.67		3.67		0.04	
1	0.05% J	11.12	(4.22)	3.78	(3.00)	0.04	(0.00)
2	0.1% J	14.54	(36.26)	4.00	(8.99)	0.05	(25.00)
3	0.2% J	13.60	(27.46)	4.33	(17.98)	0.07	(75.00)
4	0.3% J	14.40	(34.95)	4.33	(17.98)	0.06	(50.00)
5	0.4% J	11.97	(12.18)	4.00	(8.99)	0.04	(0.00)
6	0.5% J	8.75	(-17.99)	2.33	(-36.51)	0.02	(-50.00)

Data in parenthesis is % increase over control.

D: Comparative Effect Of Organic Fertilizers With Biofertilizer On Yield Parameters As Compared To Control.

Parameters	Control	Treatments								
		BF	0.2% J	0.3%J	BF + 0.2% J	FYM	BF + F	0.2% J + F	0.3% J + F	BF + J + F
Grain no. on main shoot	27.67	7.48	14.70	10.22	11.90	7.48	9.50	18.97	12.03	6.14
Grain no. / plant	78.30	49.55	87.40	68.25	78.34	24.06	54.66	150.06	103.57	24.39
Grain weight of 100 seeds (g)	1.58	11.30	18.99	12.66	12.65	8.86	13.92	22.78	15.19	7.59
Grain weight / plant (g)	3.45	25.79	54.78	41.15	42.02	38.26	35.36	101.15	46.67	9.27
Straw weight (g)	11.60	19.57	25.86	31.38	23.62	27.07	12.93	35.69	42.24	14.91
Harvest index	22.92	3.97	16.84	5.67	11.12	6.63	14.66	33.51	2.40	-3.79

Data shows % increase over control

V. CONCLUSION

The present study performed during Nov. 2009 to April 2011 at Christ Church College, Kanpur, was spread over investigation concerned with the influence of organic fertilizer and to compare it with biofertilizer fertilizers on yield of wheat *Triticum aestivum* L. [(K-9107 (Deva)] to minimizes the use of chemical fertilizers, in order to make agriculture sustainable, Humic acid containing Jinong which is new to the market should be promoted and further research on this be encouraged. The present investigation will be of applied significance to growers of commercial crop of *Triticum aestivum* L.

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