

ACHARYA N.G. RANGA AGRICULTURAL UNIVERSITY
AGRICULTURAL RESEARCH STATION, AMARAVATHI

PAID UP TRIAL REPORT ON
Evaluation of Light weight Bioformulations as Agri Inputs

Name of the Sponsorer : **M/s Fibsol Life Technologies Pvt. Ltd.,
Chennai -600096**

Name of the Trial : **Evaluation of light weight Bio-formulations as Agri
inputs in Maize**

ANGRAU Memo. No. : **Memo. No.22873/Res.1(2)2019, dated. 07.01.2020 of
the Director of Research, ANGRAU, Lam, Guntur.**

Scientists involved:

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General Information:

- i. Location: Agricultural Research Station, Amaravathi, Guntur District.
- ii. University: Acharya NG Ranga Agricultural University
- iii. Year: 2019-2020
- iv. Season: Rabi 2019-2020
- v. Crop: Maize (*Zea mays*)
- vi. Variety: VMH 6477
- vii. Soil Type: Red Soil
- viii. Irrigated/rained : Irrigated
- ix. Testing Chemical: Light Weight Bioformulation

Details of the Experiment:-

A field experiment was conducted at Agricultural Research station, Amaravathi during Rabi 2019-20 to evaluate Light weight Bioformulations as Agri Inputs and the experimental details are furnished below:

Design : RBD
 Treatments : 9
 Replications : 3
 Variety : VMH 6477
 Spacing : 60X25 cm
 Plot Size : 21.6 sq.m
 Season : Rabi 2019-20
 Date of Sowing : 01.02.2020
 Date of Harvest : 21.05.2020
 Number of applications : 2 (Two) Basal and 30 days after sowing
 Date of applications : 01.02.2020 and 03.03.2020

DETAILS OF THE TREATMENTS:

TRT No.	Treatment	Dose
1.	Control no additional inputs added	-
2.	FIB-SOL-Gel	50ml/acre at two split doses
3.	NPK Commercial Biofertilizers	2kg each of NPK biofertilizers/acre
4.	Chemical: POP+FYM	As per the University package of practice (N: 100-120 Kg/Ha P: 60 Kg/Ha K: 30-40 Kg/Ha N is applied in 3 splits, one at sowing, knee-high, and tasselling stage P and K as basal soil application)
5.	Chemical: POP+FYM+FIB-SOL-Gel	University POP + Fibsol Gel
6.	Chemical: 75% +FYM+FIB-SOL-Gel	75% University POP+Fibsol Gel
7.	Chemical: POP 50%+FYM+FIB-SOL-Gel	50% University POP+Fibsol Gel
8.	University Organic Practice	As per standard University POP Organic practice
9.	University Organic Practice	Organic Practice + FIBSOL

		GEL
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METHODOLOGY:

The experiment was laid out in red (light) soil with RBD design consisting of 9 treatments (Treatment details given in the above table) with three replications. The experiment was taken up during Rabi - 2020 as irrigated crop. The variety used was VMH 6477 with spacing of 60X25 cm.

Soil Analysis:

The soil sampling was done initially and then 30, 60 DAS and at Harvesting of the crop for microbiological and chemical analysis.

Soil pH: The pH was measured by using pH meter.

Organic Carbon:

Soil organic - carbon was estimated following the method described by Walkley et. al (1938)

Available Nitrogen (N)

Available Nitrogen content of the soil was determined by following alkaline potassium permanganate method of Subbiah et.al (1956).

Available phosphorous (P)

Available P in the soil was determined by Olsen's method described by Olsen et.al. (1954).

Available Potassium(K)

Available potassium content from soil was extracted by using IN NH₄OAC. The concentration of potassium in the extract ant was determined by flame photometer.

Microbiological Analysis: Total microbial count for the above samples soils was done by standard spread plate technique using Nutrient agar (Bacteria), MRBA (Fungi) and Actinomycetes agar (Actionmycetes)

Dehydrogenase activity: It was determined by the method described by Casida et al (1964).

Plant analysis:

The total NPK analyzed from the plant sample after harvest of the crop.

Nitrogen Content (%): Nitrogen content (%) in the plant samples was estimated by the micro Kjeldhal method (AOAC, 1965) using Kelplus N Analyser.

Number of leaves: Total number of leaves per plant in each treatment were counted at 30,50,75 (DAS) and at harvest time in each treatment. The mean value of the leaves from 3 replications was recorded.

Plant height: Plant height was measured at regular intervals in each treatment and expressed in cm. The mean value of the plants from 3 replications was recorded.

Root dry weight: Root weight was recorded after drying of root samples in hot air oven at 60⁰c. The mean root dry weight value of 3 samples was recorded and expressed in grams.

Shoot Dry Weight: The straw from pots after harvesting was dried under direct exposes to sun, weighed and converted into kg/ha.

RESULTS:

The results obtained in this trial on "Evaluation of Light weight Bioformulations as Agri Inputs in maize" are outlined below.

Germination: There are not much differences in germination of maize was observed between the treatments. On an average 98 per cent germination was recorded in all the treatments.

Number of leaves per plant: Highest numbers of leaves per plant (21) were recorded in the treatments with Fibsol gel+chemical:POP+FYM and in the treatment where Fibsol gel was applied with University organic practice and these two treatments were significantly differ over control and application of Fibsol gel and commercial biofertilizers alone, however, it was on par with other treatments.

Plant height (cm): Highest plant height (204.82cm) was recorded in the treatment where Fibsol gel was applied with university organic practice and it was significantly differed over control and application of Fibsol gel and commercial biofertilizers alone and University organic practice. However, it was on par with other treatments.

Shoot Dry biomass: Highest shoot biomass (10502kg/ha) was recorded in the treatments where Fibsol gel+chemical:POP+FYM were applied and it significantly differ with all other treatments except with the treatments chemical: 75%POP+FYM, and Fibsol gel+chemical:POP+FYM

Root Dry biomass: Root dry biomass also followed the similar trend as that of shoot dry biomass where highest dry root biomass (4255kg/ha) was recorded in the treatment with Fibsol gel+chemical: POP+FYM and it significantly differ with all other treatments except in the treatments chemical:75% POP+FYM+Fibsol gel +chemical POP+FYM

Grain Yield: Grain yield was more in the treatments with Fibsol gel+chemical POP+FYM (8278 kg/ha) and it was on par with treatment with chemical:75% POP+FYM+Fibsol gel,

Chemical:75% POP+FYM alone and University organic practice, However, it significantly differs with other treatments.

Test Weight (100 Seeds): Highest test weight (25.66g) was recorded in the treatments with Fibsol gel+chemical: and it was on par with treatment with chemical:75% POP+FYM+Fibsol gel, chemical:75% POP+FYM alone and University organic practice, However, it significantly differs with other treatments.

Shoot Nitrogen Content: Highest shoot nitrogen (0.71%) was recorded in the treatments with Fibsol gel+chemical: POP+FYM and It was on par with treatment with chemical: 75% POP+FYM+Fibsol gel, chemical:75% POP+FYM alone and University organic practice. However, it significantly differs with other treatments.

Soil pH: Compared to initial pH, at 60 DAS and at Harvest pH was decreased marginally and in between the treatments also not much difference was noticed.

Organic Carbon: Initially organic carbon content of the soil was 0.35 and it was increased during crop growth period. At 60 DAS, Highest OC content (0.61%) of the soil was recorded in the treatments with Fibsol gel+University organic practice and least in the control with no inputs, During harvesting OC content of the soil followed the similar trend but it was highest (0.63%) in Fibsol gel + University organic practice.

Dehydrogenase activity: Dehydrogenase activity of the soil was determined during flowering stage as this is the stage of peak microbial activity. It was highest (33.60 $\mu\text{g TPF g}^{-1} \text{ day}^{-1}$) in the treatments with Fibsol +gel University organic practice and least (18.60 $\mu\text{g TPF g}^{-1} \text{ day}^{-1}$) in control with no inputs.

Soil Nitrogen: Available soil nitrogen initially was 133kg/ha and it got increased over crop growth and at 60 DAS it was highest (205kg/ha) in the treatment with Fibsol gel+University organic practice and it was on par with the treatments with University organic practice and Chemical: POP 50% FYM-FIB-SOL-Gel. During harvest also it followed the similar trend as that of 60 DAS.

Available phosphorous: Initially available phosphorous was 21kg / ha and it got increased over crop growth and at 60 DAS it was highest (37.50kg/ha) in the treatment with chemical:POP+FYM+FIB-SOL-Gel and it was on par with the other treatments except control with no added inputs, During harvest also it followed the similar trend as that of 60 DAS

Available Potassium: Initially available phosphorous was 232kg/ha and it got increased over crop growth and at 60 DAS it was highest (263.50kg/ha) in the treatment with chemical:75% POP+FYM+FIB-SOL-Gel and it was on part with the other treatments except control with no

added and application of Fibsol gel and commercial biofertilizers alone. During harvest also it followed the similar trend as that of 60 DAS.

Microbial Population: Total microbial population of rhizosphere soil in response to different treatments of this study was determined at 30 DAS, 60 DAS and harvesting and given in table 4, over initial microbial population, it was increased gradually up to 60 DAS and decreased during harvesting. However, bacterial population on 30 DAS was highest (23.66×10^6 CFU/g) in control with no inputs. The similar trend was noticed at 60 DAS and harvesting. The fungal and actinomycetes population also followed the similar trend where fungal and actinomycetes population was highest in the treatment with Fibsol-Gel + University organic practice and least in control with no inputs.

CONCLUSION:

In this trial application of biofertilizers improved plant growth. Yield, soil nutrient status and microbial activity in the soil during maize cultivation. Fibsol gel performed better over other commercial bioformulant applied. Further growth and yield was improved when Fibsol gel is applied with recommended POP+FYM and with University organic practice over applying Fibsol gel alone.

**TABLE 1. EFFECT OF APPLICATION OF FIBSOL GEL AND COMMERCIAL BIOFETILZERS ALONG WITH OTHER TREATMENTS
ON PLANT GROWTH AND YIELD OF MAIZE**

TREATMENTS	GERMINATION (%)	NO. OF LEAVES	PLANT HEIGHT (CM)	SHOOT BIOMASS (KG/HA)	ROOT BIOMASS (G/PLANT)	GRAIN YIELD (KG/HA)	TEST WEIGHT (100 SEEDS)	SHOOT NITROGEN (%)
Control-No additional inputs added	98	15	175.56	7237	2761	6933	21.66	0.42
FIB-SOL-GEL	98	16	189.58	8525	3580	7508	24.33	0.50
NPK Commercial Biofertilizers	98	16	187.75	7827	3287	7200	23.66	0.49
Chemical: POP+FYM	98	18	195.98	9608	3939	8217	25.33	0.68
Chemical: POP+FYM+FIB-SOL-GEL	97	21	212.75	10502	4255	8278	25.66	0.71
Chemical: 75% POP+FYM+FIB-SOL-GEL	98	19	197.51	10397	4159	7888	24.33	0.70
Chemical: 50% POP+FYM+FIB-SOL-GEL	98	19	195.37	8099	3402	7647	23.66	0.65
University Organic Practice	98	19	188.51	8601	3498	7500	23.00	0.66
University Organic Practice+FIB-SOL-GEL	98	21	204.82	9361	3931	8042	25.33	0.68
SE(M)₊	0.70	1.25	5.21	455.67	258.50	225.75	0.95	0.03
CD at 5%	2.30	3.20	14.85	1361.35	698.40	607.50	2.59	9.10

**TABLE2. EFFECT OF APPLICATION OF FIBSOL GEL AND COMMERCIAL BIOFERTILIZER ALONG WITH OTHER TREATMENT
ON PH, ORGANIC CARBON CONTENT AND DEHYDROGENASE ACTIVITY IN SOILS.**

Treatment	Soil pH			Organic Carbon (%)			Dehydrogenase activity (β TPF /day /g)
	Initial	60 DAS	A1 Harvesting	Initial	60DAS	At Harvesting	
Control No additional inputs added	7.8	7.6	7.5	0.35	0.39	0.41	18.60
FIB-SOL-Gel		7.4	7.4		0.45	0.46	22.67
NPK Commercial Biofertilizers		7.5	7.4		0.44	0.46	19.94
Chemical:POP+FYM		7.6	7.5		0.44	0.45	20.90
Chemical: POP+FYM+FIB-SOL-GEL		7.6	7.4		0.46	0.48	25.45
Chemical: 75% POP+FYM+FIB-SOL-GEL		7.5	7.4		0.45	0.48	24.25
Chemical: POP 50% +FYM+FIB-SOL-GEL		7.5	7.3		0.43	0.50	24.65
University Organic Practice		7.2	7.2		0.55	0.57	30.323
University Organic Practice +FIB-SOL-Gel		7.2	7.2		0.61	0.63	33.60

TABLE 3 EFFECT OF APPLICATION OF FIBSOL GEL AND COMMERCIAL BIOFERTILIZER ON SOIL AVAILABLE NITROGEN, PHOSPHOROUS AND POTTASSIUM CONTENT OF HE SOIL

Treatments	SOIL CHEMICAL PROPERTIES								
	INITIAL			60 DAS			AT HARVESTING		
	Nitrogen (Kg/ha)	Available Phosphorous (Kg/ha)	Available Potash (Kg/ha)	Nitrogen (Kg/ha)	Available Phosphorous (kg/ha)	Available Potash (kg/ha)	Nitrogen (kg/ha)	Available Phosphorous (kg/ha)	Available potash (kg/ha)
Control No additional inputs added	133	21	232	153.25	24.50	237.33	151.26	20.50	230.50
FIB-SOL-Gel				169.33	32.33	241.00	162.72	28.00	237.33
NPK Commercial Biofertilizers				165.66	32.66	242.33	163.07	31.00	233.66
Chemical:POPFYM				178.45	29.66	255.33	172.16	28.33	240.00
Chemical: POP+FYM+FIB-SOL-Gel				183.66	37.50	262.66	175.61	35.66	256.50
Chemical: 75% POP+FYM+FIB-SOL-Gel				192.50	35.00	263.50	185.44	33.00	253.66
Chemical: POP 50%+FYM+FIB-SOL-Gel				195.33	35.33	259.00	180.00	32.33	248.66
University organic practice				197.66	32.55	253.33	189.66	30.00	241.00
University organic practice+FIB-SOL-GEL				205.66	34.66	261.50	200.70	30.66	248.33
SE(M)_±	-	-	-	3.95	1.23	5.15	4.50	1.20	3.90
CD at 5%	-	-	-	10.75	3.46	14.85	18.24	3.39	16.53

TABLE 4. EFFECT OF APPLICATION OF FIBSOL GEL AND COMMERCIAL BIOFERTILIZERS ALONG WITH OTHER TREATMENTS ON SOIL MICROBIAL POPULATION

Treatments	MICROBIAL POPULATION											
	INITIAL			30 DAS			60DAS			AT HARVESTING		
	Bacteria (- x10 ⁶ CFU/g)	Fungi (-x10 ⁴ CFU/g)	Actinomycetes (-x10 ⁵ CFU/g)	Bacteria (-x10 ⁶ CFU/g)	Fungi (-x10 ⁴ CFU/g)	Actinomycetes (-x10 ⁵ CFU/g)	Bacteria (-x10 ⁶ CFU/g)	Fungi (-x10 ⁴ CFU/g)	Actinomycetes (-x10 ⁵ CFU/g)	Bacteria (- x10 ⁶ CFU/g)	Fungi (-x10 ⁴ CFU/g)	Actinomycetes (-x10 ⁵ CFU/g)
Control No additional inputs added	11	5	14	13.66	7.33	17.33	22.33	10.00	19.33	12.66	6.33	18.00
FIB-SOL-GEL				15.33	6.66	17.66	31.66	13.66	21.33	14.66	6.66	19.00
NPK Commercial Bio Fertilizers				14.66	5.33	18.66	29.66	14.33	22.00	14.00	5.66	18.66
Chemical: POP+FYM				15.00	9.33	19.33	26.66	16.00	19.66	13.66	8.66	20.00
Chemical: POP+FYM+F IB-SOL-GEL				17.33	11.66	18.66	33.66	16.66	24.00	15.00	9.66	21.66
Chemical: 75% POP+FYM+F IB-SOL-GEL				17.50	9.66	18.33	32.33	15.66	25.33	14.66	9.00	22.00
Chemical: POP 50%+FYM+F IB-SOL-GEL				16.66	8.66	17.66	35.66	15.00	23.00	15.33	8.00	20.66
University Organic Practice				20.33	20.66	26.66	41.00	37.33	30.66	22.66	18.66	26.66
University Organic Practice +FIB-SOL-Gel				23.66	20.33	29.66	44.66	36.66	31.33	23.33	18.33	26.00
SE (M)_±	-	-	-	1.04	0.87	1.25	2.12	1.80	1.58	1.15	0.60	2.20
CD at 5%	-	-	-	3.12	2.73	3.81	5.80	5.21	4.31	2.95	1.96	5.50