Promotion of Liquid Bio-fertilizers through Cluster Front Line Demonstrations

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ABSTRACT

Kirshivigyna Kendra, Navsari Agricultural University, Navsari is conducting front line demonstrations and cluster front line demonstrations in various crops in adopted villages. Cluster front line demonstration found to be the effective tool to reach out large number of farmers in a short period of time. Thus extension worker can effectively implement a new technology and results are significant. Hence to popularize and promote the liquid bio fertilizer products of NAU viz., Rhizobium, Potash mobilizing bacteria (KMB), Phosphorus solubilizing bacteria (PSB), Azatobator and Acetobactor. Since five years KVK scientists are doing prompt attempt to promote liquid bio-fertilizers and conducted CFLDs in cereals, pulses, sugarcane and horticulture crops. These bio-fertilizers make nutrients that are naturally abundant in soil or atmosphere usable for plants. Field studies have demonstrated them to be effective and cheap inputs, free from the environmentally adverse implications that chemicals have. These inputs have multiple beneficial impacts on the soil and can be relatively cheap and convenient for use. At present farmers realized the significance of liquid bio-fertilizers in the district Navsari. The acceptance at the farmers end would give confidence and motivate to the scientists and agriculture extension workers.

Keywords: *Bio-fertilizers, Seed treatment, Liquid biofertlizers, Flds, Cfld*

INTRODUCTION

For a sustainable agriculture system, it is essential to use bio-fertlizers which can benefit the plant and cause no damage to the soil/environment. It is one of the finest way to reduce the use of chemical fertilizers. Use of liquid bio-fertilizer is one of the efficient and pollution free methods to exploit the ability of certain microorganisms like bacteria, algae and fungi to fix atmospheric nitrogen, solubilize phosphorus and decompose organic material in the soil. When they are applied in the soil, they enhance growth and yield of crops, improve soil fertility and reduce pollution. They are known as "bio fertilizers" (www.wordpress.com).

In other words, biofertilizer is a substance which contains living microorganisms which when applied to seed, plant surfaces, or soil colonies the rhizospehere or the interior of the plant and promotes growth by increasing the availability of primary nutrients to the host plant (Mazid *et al*., 2011).Bio-fertilizers are products containing living cells of different types of microorganism, which have an ability to convert nutritionally important elements to available form through biological processes (Hegde et al.,1999; Vessey, 2003). In recent years, bio-fertilizers have emerged as an important component of the integrated nutrient supply system and hold a great promise to improve crop yield through environmentally better nutrient supplies.Liquid bio-fertilizers are special liquid formulations containing not only thedesired microorganisms and their nutrients but alsospecial cell protectants or chemicals that promoteformation of resting spores or cysts for longer shelflife and tolerance to adverse conditions. (Ghosh, 2004).

METHODOLOGY

Present study was conducted in villages of Navsari district where Front Line Demonstration and Cluster Front Line Demonstration on seed treatment, seedling treatment, set treatment and soil application in paddy, pulses, sugarcane and horticultural crops were conducted by Krishi Vigyan Kendra, Navsari, district Navsari. In total 2018 FLDs were conducted in five years. There are different methods of bio-fertilizer application in different crops. Application methods are described as follows.

Application of bio-fertilizers: There are four types of methods for application of bio-fertilizers: Seed treatment, set treatment, seedling treatment and soil treatment

Seed treatment: For inculcation of cereal like rice, pulses like green gram and pigeon pea, seed treatment of bio-fertilizer is recommended. 10 ml of liquid bio-fertilizer is sufficient to treat 1 kg seed. On this basis the dose of bio-fertilizer per acre were worked out, based on the seed rate.

Method: Spread the required quantity of seeds on a clean cemented floor. Then sprinkled the liquid biofertlizer on the heap of the seeds and mixed by hand so that thin coating is uniformly applied to the seeds. Later spread the seeds under shade for some time for drying and then sown.

Set treatment: This method wasused for treating the sets of sugarcane.

Method: One litre of bio-fertilizer was mixed in 40-50 litres of water. The cut pieces of planting material required for sowing one acre were kept immersed in the suspension later brought out the cut pieces after 30 minutes of immersion and dried them in shade for some time before planting.

Seedling treatment : This method was practiced for crops like paddy.

Method: Took one litre of liquid bio-fertlizerin 10-15 litres of water. Get the seedlings required for one acre and make small bundles of seedlings. Dip the root portion of these seedlings in this suspension for 15-30 minutes and transplant immediately. Generally, the ratio of inoculants and water is 1:10

Application in mango and sapota crop: Mango plants were pruned after harvesting. After pruning, the soil in the bed is dug up with a fork with due care to avoid any damage to the roots. Applied mixture of bio-fertilizer and FYM/soil by incorporating it into the soil followed by irrigation.

Precautions were taken during bio-fertilizers treatment: No other fertilizers or insecticides/ fungicides should be mixed with seeds that are treated withbio-fertilizer. Before conduct the demonstration training to farmers of respective villages was imparted with respect toenvisaged technological interventions. All other steps like site selection, farmers selection, layout of demonstration, farmers participation etc. were followed as suggestedby Choudhary (1999).

RESULTS AND DISCUSSION

Training programmes and demonstration on bio-fertilizers

Training cum bio-fertilizers demonstration programmes were conducted during 2013-14, 2014-15, 2015-16, 2016-17 and 2017-18at Krishi Vigyan Kendra (KVK), Navsari Agricultural University, Navsarito train the farmers on use of bio- fertilizers and method of application strategies to achieve sustainable production.Regular field visits were conducted to observe the efficacy of bio- fertilizers.

Krish Vigyan Kendra, Navsari conducted total 169 training programmes during last five years to bring the awareness on integrated nutrients management and sustainable production in different crops through the use of bio-fertilizers and bio pesticide and total 9975 participant were benefited. Among 169 training programmes, 41 for paddy, 28 for pigeon pea, 11 for rabigreengram, 17 for mango, 14 for sapota, 13 for chickpea, 7 for Indian bean, 13 for sweet corn and 23 for summer greengram were conducted (Table-1). Similarly, KVK, Navsari conducted the demonstration on low cost eco-friendly technologies particularly, of use of bio fertilizers either as a seed treatment or seedling treatments or mix with the organic manure and apply in tree crops in the different crops namely paddy, pigeonpea, rabigreengram, mango, sapota, chickpea, indianbean, sweetcorn, okra, sweetcorn and summer green gram covering the area of 732.39, 261.63, 80.8, 396, 336.2, 90.33, 23, 97, 10 and 356.2 hectors and number of participants of 3523, 1917, 434, 1053, 836, 703, 252, 794, 50, and 1699 during last five years, respectively. Demonstrations on use of

Table-1

Numbers of training organized and beneficiaries remain present on the use of bio-fertilizers in different crops during the last five years.

Year/ Crop	2013-14		2014-15		2015-16		2016-17		2017-18		Grand Total	
	No. of training	No. of beneficiaries	No. of training	No. of beneficiaries	No. of training	No. of beneficiaries	No. of training	No. of beneficiaries	No. of training	No. of beneficiaries	No. of training	No. of beneficiaries
Paddy	6	366	8	775	11	811	7	536	9	694	41	3182
Pigeon pea	6	261	4	226	5	265	6	314	7	452	28	1518
Green gram (Rabi)	2	46	2	93	1	40	3	126	3	130	11	435
Mango	4	297	3	185	2	132	3	184	5	255	17	1053
Sapota	4	255	3	170	3	161	2	131	2	88	14	805
Gram	2	95	3	132	3	163	2	122	3	196	13	708
Indian bean	1	54	1	38	2	84	2	60	1	30	7	266
Sweetcorn	4	250	4	230	3	136	2	102	0	0	13	718
Okra	0	0	2	45	0	0	0	0	0	0	2	45
Greengram (Summer)	4	353	4	119	4	200	6	289	5	284	23	1245
	33	1977	34	2013	34	1992	33	1864	35	2129	169	9975

Table-2

Number of beneficiaries and area covered under the demonstration on the use of bio-fertilizers in different crops during the last five years.

Year/ Crop	2013-14		2014-15		2015-16		2016-17		2017-18		Grand Total	
	Area/ Ha.	No of beneficiaries	Area/Ha.	No of beneficiaries	Area/Ha.	No of beneficiaries	Area/Ha.	No of beneficiaries	Area/Ha.	No of beneficiaries	Area/Ha.	No of beneficiaries
Paddy	71.2	353	178.6	891	183.8	919	116.4	604	182.39	756	732.39	3523
Pigeon pea	61.3	460	52	260	38	230	52	385	58.33	582	261.63	1917
Green gram (Rabi)	8	42	18	100	7.2	36	20	119	27.6	137	80.8	434
Mango	100	250	80	200	50	125	70	180	96	298	396	1053
Sapota	100	250	80	200	75	185	50	125	31.2	76	336.2	836
Gram	8.5	102	7	130	15.1	165	22.4	126	37.33	180	90.33	703
Indian bean	5.7	57	2	40	8.3	79	5	50	2	26	23	252
Sweetcorn	46	300	25	245	15	142	11	107	0	0	97	794
Okra	0	0	10	50	0	0	0	0	0	0	10	50
Green gram (Summer)	125	600	59.2	212	50	225	70	350	52	312	356.2	1699
	525.7	2414	511.8	2328	442.4	2106	416.8	2046	486.85	2367	2383.55	11261

Table -3

Average yields of demonstration and check plots of different crops on the use of bio-fertilizers during the last five years.

Year/ Crop	2013-14		2014-15		2015-16		2016-17		2017-18		Average of Five Year	
	Average Yield/ha(q/ha)											
	FLD	Check	FLD	Check	FLD	Check	FLD	Check	FLD	Check	FLD	Check
Paddy	49.46	41.39	53.69	43.00	55.53	40.24	52.79	40.93	49.07	39.69	52.11	41.05
Pigeon pea	6.96	5.42	11.05	9.45	7.25	6.79	11.34	7.8	10.8	9.43	9.48	7.78
Green gram (Rabi)	9.36	8.24	9.4	8.2	8.84	7.60	8.78	6.92	8.05	6.25	8.89	7.44
Mango	110.60	89.40	98.4	84.8	94.5	83.4	97.8	82.8	100.4	86.7	100.34	85.42
Sapota	195.0	158.0	148.4	129.6	141.8	128.7	150.7	131.5	147.6	128.3	156.70	135.22
Gram	10.35	7.90	9.9	8.42	8.38	7.23	10.21	7.32	12.28	9.87	10.22	8.15
Indian bean	8.85	7.65	9.25	7.45	15.14	13.64	8.68	7.47	9.14	7.67	10.21	8.78
Sweetcorn	104.80	0.00	103.75	0.00	98.6	0.00	99.26	0.00	0	0	81.28	0.00
Okra	0	0	111	98.4	0	0	0	0	0	0	22.20	19.68
Greengram (Summer)	7.64	6.59	7.95	6.80	9.18	7.32	8.14	6.88	7.91	6.46	8.16	6.81
	503.02	324.59	562.79	396.12	439.22	294.92	447.7	291.62	345.25	294.37	2297.98	1601.62

bio-fertilizers were conducted on 2383.55 ha area and total 11261 farmer's field in different crops during last five years.

Cluster Frontline demonstrations

Cluster Frontline demonstrations on greengramand chickpea were conducted by using variety Meha, Co-4 and GG-2 and GG-3, respectively in an area of 526.53 ha on2836 farmer's field of cluster ofKharjai and Bartad villages block TA. Vansda. The need based inputs provided to farmers particularly seed of pulses likeMeha, Co-4 and GG-2 as well as GG-3 @ 25 and 65 kg/ha, respectively andRhizobium spp. as well as other liquid biofertlizer KMB and PSB each @ 2 liter/ha along with microbial pesticides like lecanicillumlecani, beaureabassianaand metarahiziumanisopleae 500 gm.

The data presented in Table-3 concluded that average yield of rabi and summer greengram demonstration plots of five year8.89 and 8.16 q/ha were found in demonstration plot of variety Co-4 and Meha as compared to control plots 7.44 and 6.81q/ha in control plot. Likewise,in demonstration plot of paddy crop, the average yield of 52.11 q/ha was observed over control plot of 41.05q/ha, which was 26.94 per cent higher yield in demo instration plots.. Whereas in demonstration plot of chickpea,the average yield of 10.22 q/ha was recorded over control plot (8.15q/ha). Similarly, in mango, sapota and sweet corn crop, the average yield of 100.34, 156.70 and 81.28 q/ha were observed in demonstration plots over check plots of 85.42, 135.22 and 0.0 q/ha, respectively. This finding is in corroboration with the findings of Poonia and Pithia (2011) and Narayan and Kumar (2015).This improvement in yield might be due to the application of seed treatment with the different biofertilizers, timely sowing, application of recommended dose of fertilizers, proper and timely weed management and integrated pest management practices.According to Reddy (2009) reported that lack of knowledge, availability of seed, lack of technical knowledge regarding improved pulse cultivation are some of the important constraints in pulse production. Thus, the result of these Cluster Frontline Demonstration of various pulses have been very encouraging in showing production potential of various technologies in various field conditions across Navsari district.

CONCLUSION

The use of bio-fertilizers and its adoption rate has consistently increased over a time. Native microbial population in the soil are more adapted to the environment and out compete the inoculated population.Cluster frontline demonstration on use of bio-fertilizers incereals,pulses and horticultural crops conducted in theNavsari district and result concluded that average yield of 52.11, 9.48, 8.89, 10.22, 8.16, 100.34 and 156.70 q/ha were found in demonstration plot as compared to 41.05, 7.78, 7.44,8.15, 6.81,85.42 and 135.22 q/hain control plotof paddy, pigeonpea, rabigreengram, chickpea, summer greengram, mango and sapota, respectively. There was on an average 26.94&22.25 percent increase in yield were observed indemonstration plot over farmers practicein cereals and pulses, respectively. It was observed that potential yield can be achieved by imparting scientific knowledge to the farmers, providing the quality need based inputs and proper application of inputs. Horizontal spread of improved technologies may be achieved by the successful implementation of frontline demonstration and various extension activities like training programme, field day, exposure visit organized in CFLDs programmes in the farmer's fields. For wide dissemination of technologies recommended by SAUs and other research institute, more number of FLDs should be conducted.

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