Indian Council of Agricultural Research

Proforma for Certifying a Technology

Effect of YIELDON-Bio-stimulant on crop growth, physiological and biochemical changes, and yield of Rice crop

Submitted by
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Certifying Products/Technologies/Process/Methodology/Model/Protocol/Policy etc.

Item	
1. Name of the product/technology (as defined above)	Effect of YIELDON- bio-stimulants on crop growth, physiological and biochemical changes, and yield of Rice crop
2. Name and address of the Institute	ICAR-Indian Institute of Rice Research, Rajendranagar, Hyderabad – 500030, Telangana
3. Institution(s) responsible for developing/evaluating/identifying including collaborators, if any	Valagro Bio Sciences, Ltd., The Platina Building, A-904, 9tj floor, Gachibowli, Serilingampalli, Hyderabad-500032.
4. Source of product/technology (Research Project/Student Research/Any other ad-hoc research study)	Research Project
5. Period of development/evaluation/validation	2021-2022
6. Developers (Lead and Associates)	Dr. R. Mahender Kumar
7. Summary of the product/technology (maximum of 200 words)	According to the FAO report (Food and Agriculture Organization), global rice requirement by 2025 will be 800 m t. At the moment, rice production is less than 600 m t and an additional 200 m t is needed, which has to be produced by increasing productivity per unit area against the diminishing resources. To meet our needed yield without affecting the productivity of rice has to be achieved through the proper utilization of resources. The use of biostimulants is an agronomic tool to improve plant tolerance to abiotic stress in plants. Biostimulants have much potential to improve crop production through enhanced yields, grain quality, and increased sustainability of agronomic production systems, particularly in relation to nutrient management. However, there is great variability in the efficacy of biostimulants and a limited understanding of the mechanisms responsible in field-tested scenarios where differences are observed. These unknown mechanisms may align with the recognized soil health indicators,

	providing opportunities for unrealized biostimulant potential beyond crop growth and development. This review aims to identify the predominant types of crop biostimulants, the known understandings of their modes of action, and examples of their current field efficacy with an outlook for their future. The focus on fertilizer recovery potential is currently the leading research strategy for biostimulant use in row crop systems, with growing attention to increasing grain yield, which is often a result of more efficient nutrient use. While many biostimulants are targeted for application to row crops for increased productivity, many products achieve these responses through impacts on soils and the biology of the root zone. A closer evaluation of biostimulant effects on soil quality and biological indicators may reveal previously unknown benefits to their application. With greater government and public awareness of agronomic practices and their influence on water quality and nutrient management, the use of biostimulants as a solution to more sustainable practices and improved soil quality provides a viable option even in the absence of measurable yield increases. Grain yield due to seaweed bio-stimulants application varied from 5.31 to 5.58 t/ha and significantly increased over recommended dose of fertilizer alone (5%). Percent increase of grain yield was 4.15 to 9.14 per cent over recommended dose of fertilizer (Arun et al 2020). The experiment was conducted to study the effect of bio-stimulant YIELDON on the yield and yield attributes of transplanted rice in kharif 2021 and rabi 2021-22seasons in randomised block design with nine replications. The YIELDON was applied as foliar spray three times at tillering, panicle initiation and booting stage. The yield attributes and yield was significantly superior in YIELDON treated plots over control. The average percentage grain yield increase was 12.04 % in T3: Yieldon

	1.5L/ha followed by 11.15 % in T4: Yieldon 2L/ha and 10.97 % in T2: Yieldon 1L/ha treatments over control treatment.
8. Is it a new technology? (Yes/No). If no, prove the details of the technology modified	Yes
9. IPR involved, if any (Patent/Copyright/Industrial Design Registration/Variety/Germplasm registration). Provide Filed/Granted number	NA
10. Validation procedure followed (within Institute, collaborators, multilocation/multi-site testing)	Within institute
11. Brief description of research output/technology	

a. **Objective**

- To evaluate and test effect bio-stimulant YIELDON on crop growth, physiological and biochemical changes, and yield of Rice crop

b. **Methodology**

The experiment was conducted to study the effect of bio-stimulant Yieldon on the yield and yield attributes of transplanted rice in kharif 2021 and rabi 2021-22seasons in randomised block design with nine replications. The yYeldon was applied as foliar spray three times at tillering, panicle initiation and booting stage.

c. **Yield attributers & Yield**

Plant height was recorded at 30, 60, 90 days after transplanting and at harvest time and there was no significant difference among four treatments AT 30, 60 & 90 DAT.

Number of tillers per square meter varies at critical stage of growth. Yieldon treatments influenced the number of tillers per square meter significantly at all stages of growth. Maximum no of tillers was recorded in T4: Yieldon 2L/ha (604) followed by T3: Yieldon 1.5 L/ha (523) and T2: Yieldon 1L/ha (423) which contributed for higher yields in treated plots whereas lower no tillers per square meter was recorded in untreated control plot (382).

The chlorophyll content in plant leaves was recorded by SPAD meter at 30, 60 and 90 DAT and were not significant at all stages. Maximum SPAD readings were recorded in Yieldon treated plots over control. The maximum SPAD value content indicates the higher chlorophyll and photo synthesis.

The mean no of panicles per square meter was significantly higher in Yieldon treated plots over control. The mean maximum panicle no per square meter was recorded in T4: Yieldon 2L/ha (592) followed by T3: Yieldon 1.5L/ha (514) followed by T2: Yieldon 1L/ha (420). The Yieldon treatments contributed significantly for higher panicle weight and no of grains per panicle over control plot. Yieldon treatments did not contribute significantly for test weight.

Treatment with Yieldon was significantly contributed for higher grain yield over control plot. Maximum grain yield was recorded in T3: Yieldon 1.5L/ha (6.61 t/ha) followed by T4: Yieldon 2L/ha (6.56 t/ha) and was on par with T2: Yieldon 1.5L/ha (6.55 t/ha) whereas the Control treatment recorded 5.90 t/ha.

The average percentage grain yield increase was 12.04 % in T3: Yieldon 1.5L/ha followed by 11.15 % in T4: Yieldon 2L/ha and 10.97 % in T2: Yieldon 1L/ha treatments over control treatment.

The mean average straw yield recorded was 7.24, 7.22 and 7.16 t/ha in T3: Yieldon 1.5L/ha, T2: Yieldon 1L/ha and T4: Yieldon 2L/ha treatments respectively. The treatments contributed significantly for straw yield. The trend is nearly similar in terms of harvest index values in Yieldon treated plots which contributed for higher yield.

d. **Saving of water, labour, time and energy**

Net energy output was more in Yieldon treatments and Energy productivity was more in Yieldon treated plots (0.80, 0.79 & 0.78 kg grain / MJ input energy in T3, T4 & T2) over control (0.71 kg grain/MJ energy) plots.

Phytotoxicity

Phytotoxicity data was collected before the spay and 5, 10,15 days after spraying. There was no phyto toxicity by abiotic stress symptoms were observed across the Yieldon treatments.

e. **Cost effectiveness including B:C ratio**

Cost of cultivation was nearly same in all treated and control plots but the benefit cost ratio was superior in Yieldon treated plots and higher B:C ratio was recorded in Yieldon 1.5 L/ha followed by 2.0L/ha and 1.0 L /ha(1.93, 1.91 & 1.82) over control (1.64).

f. **Passport data of the product/ technology**

The focus on fertilizer recovery potential is currently the leading research strategy for biostimulant use in row crop systems, with growing attention to increasing grain yield, which is often a result of more efficient nutrient use. While many biostimulants are targeted for application to row crops for increased productivity, many products achieve these responses through impacts on soils and the biology of the root zone. A closer evaluation of biostimulant effects on soil quality and biological indicators may reveal previously unknown benefits to their application. With greater government and public awareness of agronomic practices and their influence on water quality and nutrient management, the use of biostimulants as a solution to more sustainable practices and improved soil quality provides a viable option even in the absence of measurable yield increases. Grain yield due to seaweed bio-stimulants application varied from 5.31 to 5.58 t/ha and significantly increased over recommended dose of fertilizer alone (5%). Percent increase of grain yield was 4.15 to 9.14 per cent over recommended dose of fertilizer (Arun et al 2020). The experiment was conducted to study the effect of bio-stimulant YIELDON on the yield and yield attributes of transplanted rice.

12. Details of relevant data generated during the development/validation	

Table. Phytotoxicity by abiotic stress in rice as influenced by application of YIELDON (0-9 scale)

Treatement		Days after application				
		Before	5	10	15	20
YIELDON	control	0	0	0	0	0
	1 L/ha	0	0	0	0	0
	1.5 L/ha	0	0	0	0	0
	2.0 L/ha	0	0	0	0	0

Table.4 Influence of YIELDON treatments on plant height at critical stage of crop growth

Treatment		Plant height (cm)			
		30 DAT	60 DAT	90 DAT	Harvest
YIELDON	Control (100% RDF)	39.07	67.41	80.59	91.74
	1L/ha	38.83	67.01	80.53	94.11
	1.5L/ha	39.75	66.02	80	96.91
	2L/ha	40.88	64.51	80.78	96.6
	Exp. mean	39.63	66.23	80.48	94.84
	CD(0.05)	4.23	4.11	2.74	2.87
	CV	8.67	5.04	2.77	2.46
	res1(t)	NS	NS	NS	**

Table . Influence of YIELDON treatments on No. of tillers at critical stage of crop growth

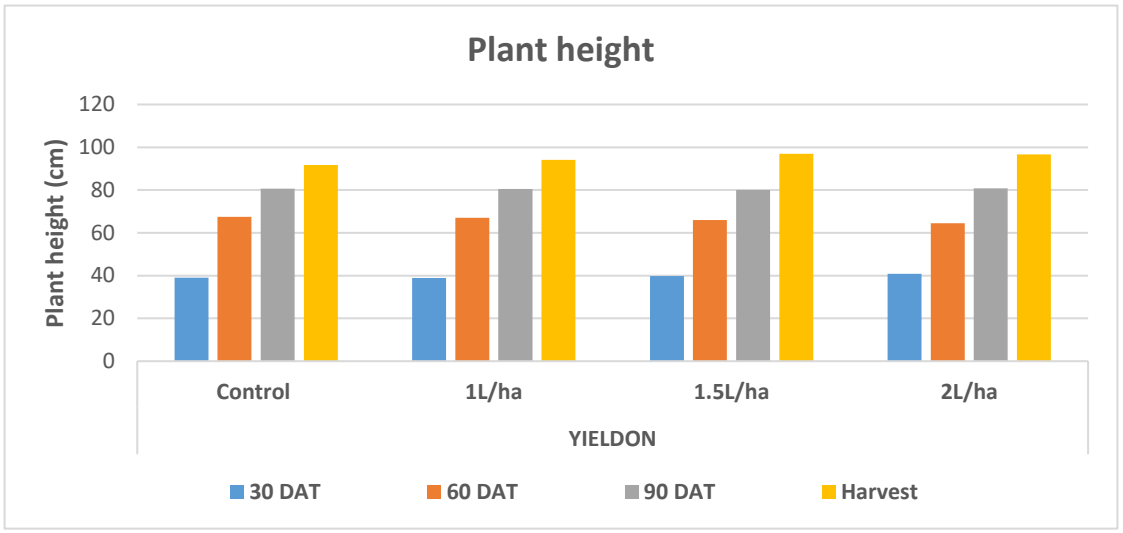
Treatment		No. of tillers/m^2			
		30 DAT	60 DAT	90 DAT	Harvest
YIELDON	Control (100% RDF)	320	364	347	382
	1L/ha	359	428	393	423
	1.5L/ha	341	510	514	523
	2L/ha	407	549	572	604
	Exp. mean	357	463	457	483
	CD(0.05)	42.04	43.74	46.22	43.56
	CV	9.58	7.68	8.23	7.33
	res1(t)	**	**	**	**

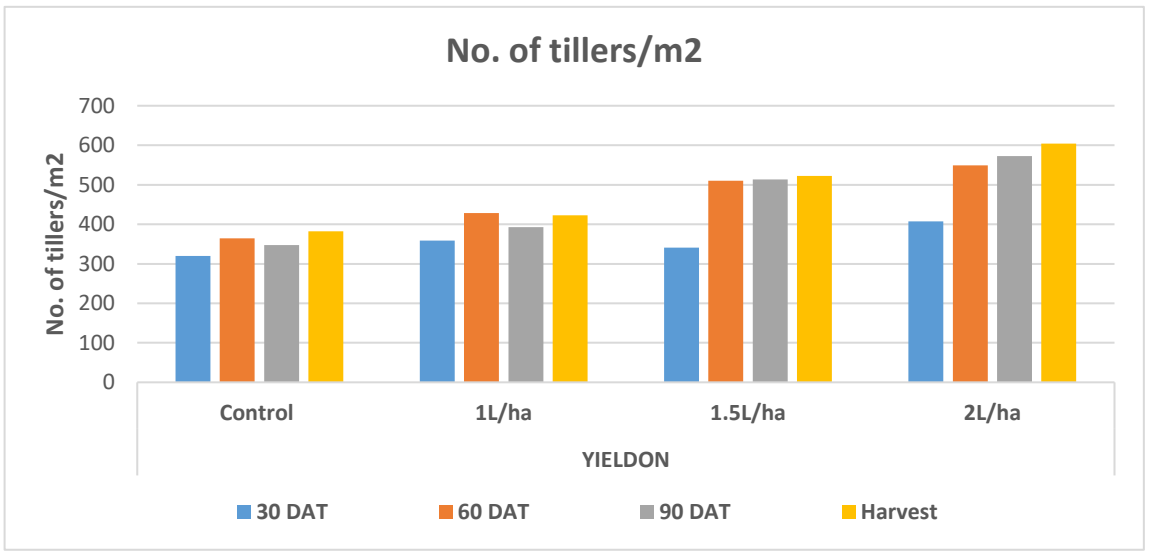
Table. Influence of YIELDON treatments on SPAD at critical stage of crop growth

Treatment		SPAD		
		30 DAT	60 DAT	90 DAT
YIELDON	Control (100% RDF)	32.42	37.93	38.93
	1L/ha	33.46	39.79	41.43
	1.5L/ha	35.24	38.34	40.11
	2L/ha	33.54	38.03	42.14
Exp. mean		33.67	38.52	40.65
CD(0.05)		2.22	3.22	3.44
CV		5.37	6.8	6.87
res1(t)		NS	NS	NS

Table . Influence of YIELDON treatments on yield & yield attributes

Treatment		No. of panicles/m2	Panicle weight (g)	Test weight (g)	No of grains/panicle	Grain Yield (t/ha)	Straw Yield (t/ha)	Harvest Index (%)
YIELDON	Control (100% RDF)	366	3.68	3.02	240	5.9	6.56	47.36
	1L/ha	420	4.15	2.99	260	6.55	7.22	47.56
	1.5L/ha	514	4.45	3.03	280	6.61	7.24	47.76
	2L/ha	592	4.45	3.13	295	6.56	7.16	47.74
Exp. mean		473	4.18	3.04	269	6.41	7.04	47.61
CD(0.05)		44.2	0.51	0.28	12.3	0.51	0.49	0.98
CV		7.6	10	7.53	3.72	6.42	5.67	1.67
res1(t)		**	*	NS	**	*	*	NS





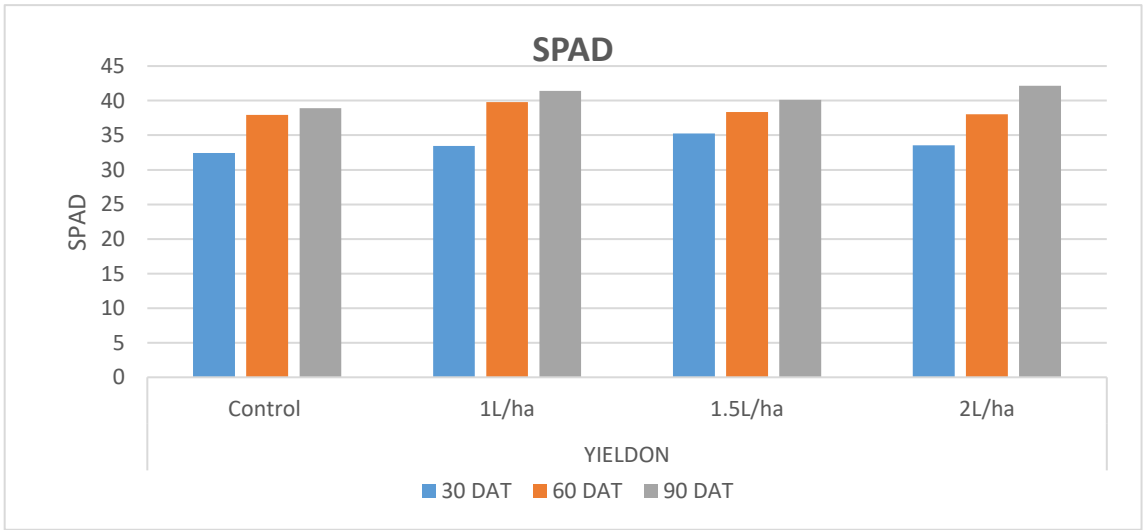


Fig. Growth parameters as influenced by YIELDON treatments

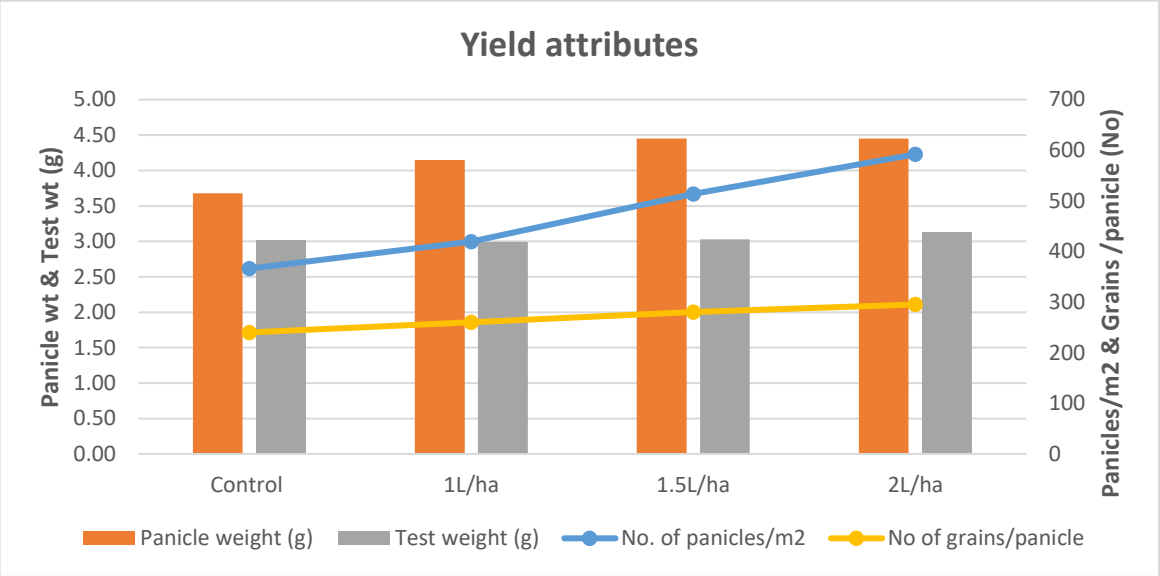


Fig. Yield attributes influenced by YIELDON treatments

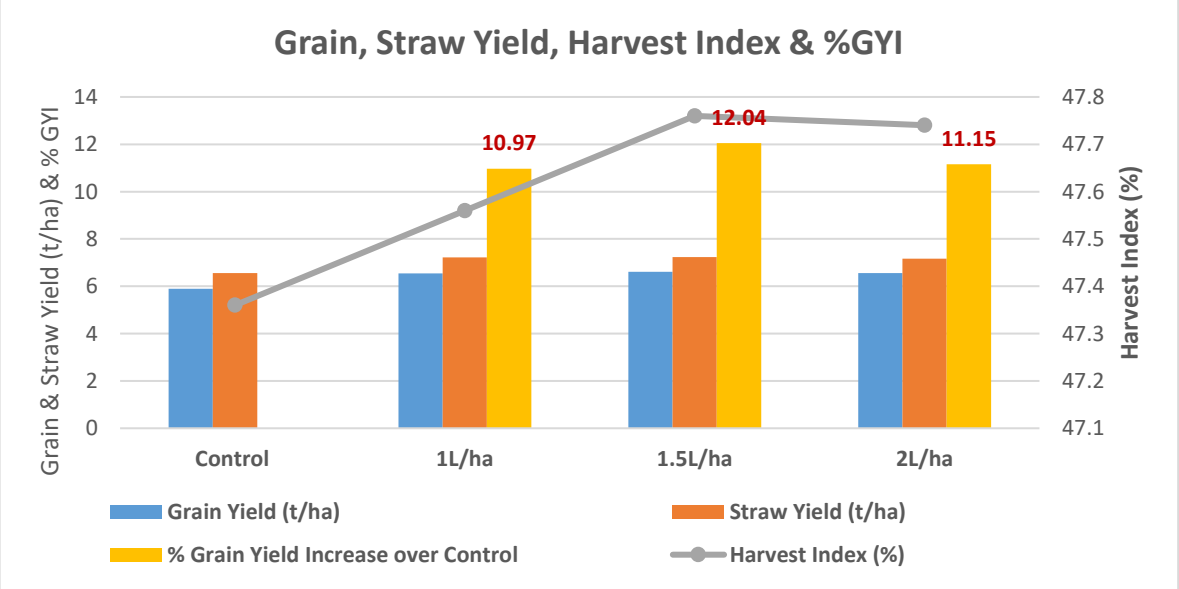


Fig. Grain, Straw yield & % grain yield increase over control as influenced by YIELDON treatments

13. Proposed stakeholders	Transplanted rice farmers
14. Commercial potential, if any	Can be commercialized
15. Publications/photos/video clipping, if any	

Control

Yieldon 1L/ha

Yieldon 1.5 L/ha

Yieldon 2L/ha

Plate 1. YIELDON experimental plot at harvest stage

- Use of Yieldon product significantly enhanced the growth parameters and grain yield
- Among the treatments T4 (Yieldon 2L/ha) found superior with 12.04% followed by T3 (Yieldon 1.5L/ha) 11.15 % and T2: (Yieldon 1.5L/ha) 10.97 % grain yield increase over control and found promising in terms of grain yield.

Declaration: I/we hereby undertake that the above information is correct. All scientists in the development of this research output have been included in the list of associates. The research output does not involve any third party IPR.

1. Name and signature of all the developers

Name	**Developer / co-developer / Collaborator**	**Signature**
Dr. R.Mahender Kumar	Developer	
Dr. B.Sreedevi	Co-developer	
Dr. Mnagaldeep Tuti	Co-developer	
Dr. S. Vijaya Kumar	Co-developer	
Dr. K. Surekha	Co-developer	
Dr. M.B.B. Prasad Babu	Co-developer	
Dr. V. Manasa	Co-developer	
Dr. Prakasam	Co-developer	
Dr. Ch. Padmavathi	Co-developer	
Dr. Senguttuvelu	Co-developer	
Dr. D. Srinivas	Co-developer	

2. Recommendations of the Head of Division

3. Recommendations of ITMC/PME

4. Recommendations o DIRECTOR

5. Recommendations of SMD