Research Paper

Potato cultivation under Zero-tillage and straw mulching: Option for land and cropping system intensification for Indian Sundarbans

Supplementary Table 1: Details of the Experiments

Experiment 1	
Year of the experiment: 2016-2017	
Objective: Selection of Suitable Potato Variety for Zero tillage straw mulching potato cultivation	
Design of Experiment: Randomized Block Design	
No. of treatments: 5	**No. of replications:** 3
Treatment Annotation	**Treatment Details**
V1	*Kufri Chandramukhi*
V2	*Kufri Jyoti*
V3	S-52
V4	S-6
V5	Local
Experiment 2	
Year of the experiment: 2018-2019	
Objective: Optimization of foliar nutrient management for for Zero tillage straw mulching potato cultivation	
Design of Experiment: Randomized Block Design	
No. of treatments: 9	**No. of replications:** 3
Treatment Annotation	**Treatment Details**
Control	RDF_{NPK}+ Zero Tillage + Mulching
RDF_{NPK} fb Urea 2% fs $_{30\ DAP}$	RDF_{NPK}+ Zero Tillage + Mulching + 2% Urea @ 30 DAP
RDF_{NPK} fb Urea 2% fs $_{30\ \&\ 50\ DAP}$	RDF_{NPK}+ Zero Tillage + Mulching + 2% Urea @ 30 & 50 DAP
RDF_{NPK} fb MOP 2% fs $_{30\ DAP}$	RDF_{NPK}+ Zero Tillage + Mulching + 2% MOP @ 30 DAP
RDF_{NPK} fb Urea 2% fs $_{30\ \&\ 50\ DAP}$ + MOP 2% fs $_{30\ DAP}$	RDF_{NPK}+ Zero Tillage + Mulching + 2% Urea @ 30 & 50 DAP + 2% MOP @ 30 DAP
RDF_{NPK} fb Boron 0.1 % fs $_{30\ DAP}$	RDF_{NPK}+ Zero Tillage + Mulching + 0.1% Boron@ 30 DAP
RDF_{NPK} fb Urea 2% fs $_{30\ \&\ 50\ DAP}$ + Boron 0.1 % fs $_{30\ DAP}$	RDF_{NPK}+ Zero Tillage + Mulching + 2% Urea @ 30 & 50 DAP + 0.1% Boron @ 30 DAP
RDF_{NPK} fb Zinc 0.5 % fs $_{30\ DAP}$	RDF_{NPK}+ Zero Tillage + Mulching + 0.5% Zn @ 30 DAP
RDF_{NPK} fb Urea 2% fs $_{30\ \&\ 50\ DAP}$ + Zinc 0.5 % fs $_{30\ DAP}$	RDF_{NPK}+ Zero Tillage + Mulching + 2% Urea @ 30 & 50 DAP + 0.5% Zn @ 30 DAP
Experiment 3	
Year of the experiment: 2021-2022	
Objective: Optimization of biostimulents application for Zero tillage straw mulching potato cultivation	
Design of Experiment: Randomized Block Design	
No. of treatments: 8	**No. of replications:** 3
Treatment Annotation	**Treatment Details**
Control	RDF_{NPK}+ Zero Tillage + Mulching (Control)
RDF_{NPK} fb *Sargassum* 5% fs $_{30\ DAP}$	RDF_{NPK}+ Zero Tillage + Mulching + *Sargassum* 5% @ 30 DAP
RDF_{NPK} fb *Sargassum* 5% fs $_{30\ DAP\ \&\ 50\ DAP}$	RDF_{NPK}+ Zero Tillage + Mulching + *Sargassum* 5% @ 30&50 DAP
RDF_{NPK} fb *Sargassum* + humic acid 5% fs $_{30\ DAP}$	RDF_{NPK}+ Zero Tillage + Mulching + *Sargassum* 5% with humic acid @ 30 DAP

RDF_{NPK} fb *Sargassum* + humic acid 5% fs $_{30\ DAP\ \&\ 50\ DAP}$	RDF_{NPK}+ Zero Tillage + Mulching + *Sargassum* 5% with humic acid @ 30&50 DAP
RDF_{NPK} fb Triacontanol (0.05% EC) 0.1% fs $_{30\ DAP}$	RDF_{NPK}+ Zero Tillage + Mulching + Tricontanol 0.05% EC @ 30 DAP
RDF_{NPK} fb Triacontanol (0.05% EC) 0.1% fs $_{30\ DAP\ \&\ 50\ DAP}$	RDF_{NPK}+ Zero Tillage + Mulching + Tricontanol 0.05% EC @ 30&50 DAP
RDF_{NPK} + Water	RDF_{NPK}+ Zero Tillage + Mulching + Water
Experiment 4	
Year of the experiment: 2021-2022	
Objective: Effect of foliar nutrient and growth regulators for Zero tillage straw mulching potato cultivation	
Design of Experiment: Randomized Block Design	
No. of treatments: 8	**No. of replications:** 3
Treatment Annotation	**Treatment Details**
Water Spray	Zero Tillage + Mulching + Water Spray
RDF $_{NPK}$ fb DAP 2% fs $_{30\ DAP}$	RDF_{NPK}+ Zero Tillage + Mulching + 2% Diammonium Phosphate At 30 Days After Planting
RDF $_{NPK}$ fb DAP 2% fs $_{30\ \&\ 50\ DAP}$	RDF_{NPK}+ Zero Tillage + Mulching + 2% Diammonium Phosphate At 30 and 50 Days After Planting
RDF $_{NPK}$ fb MOP 2% fs $_{30\ DAP}$	RDF_{NPK}+ Zero Tillage + Mulching + 2% Muriate of Potash At 30 Days After Planting
RDF $_{NPK}$ fb MOP 2% fs $_{30\ \&\ 50\ DAP}$	RDF_{NPK}+ Zero Tillage + Mulching + 2% Muriate of Potash at 30 And 50 Days After Planting
RDF $_{NPK}$ fb DAP 2% & MOP 2% fs $_{30\ DAP}$	RDF_{NPK}+ Zero Tillage + Mulching + 2% Diammonium Phosphate and 2% Muriate of Potash at 30 Days After Planting
RDF $_{NPK}$ fb DAP 2% & MOP 2% fs $_{30\ and\ 50\ DAP}$	RDF_{NPK}+ Zero Tillage + Mulching + 2% Diammonium Phosphate and 2% MOP at 30 And 50 Days After Planting
RDF $_{NPK}$ fb DAP 2% + MOP 2% & Triacontanol (0.05% EC) 0.1% fs $_{30\ and\ 50\ DAP}$	RDF_{NPK}+ Zero Tillage + Mulching + 2% Diammonium Phosphate+ 2% Muriate of Potash and 0.1% Triacontanol 0.05% EC (Miraculan) at 30 And 50 Days After Planting

Supplementary Table 2: The detailed economic analysis comparing ZTSM vs conventional

Particulars	Zero tillage mulch system of potato		Conventional tillage potato	
	Input/ha	Cost (₹/ha)	Input/ha	Cost (₹/ha)
Labour	90	18,000	240	48,000
Seed tuber	1.5 tonne	30,000	1.5 tonne	30,000
Irrigation	3	7,200	5	12,000
Tillage	-	-	4	6,000
Interculture	1	1,125	2	2,250
Fertilizer	NPK, NK	3,300	Urea, SSP, MOP	4,400
Organics	3 tonne	4,875	-	-
Pesticides	-	-	Fungicide	3,250
Cost of Cultivation (₹/ha)		64,500		105,900
Mean yield (tonne/ha)	15.21		19.02	
Gross return (₹/ha)	182520		228240	
Net return (₹/ha)	118020		122340	
Benefit Cost ratio (BCR)	2.82		2.15	

Supplementary Table 3: A comparative analysis of ZTSM system of potato cultivation

Location of the experiment	**Year**	**Season**	**Variety**	**Tuber Yield (t/ha)**	**B:C Ratio**	**Reference**

South 24 Parganas District, West Bengal, India	2017-18	*Rabi*	*Kufri Pukhraj*	20.17	2.29	Sarangi et al. (2018)
Khulna District, Bangladesh	2021-22 and 2022-23	*Rabi*	*BARI Alu 72* and *BARI Alu 78*	10.3–34.3	-	Ramírez et al. (2025)
Sontipur and Barpeta Districts, Assam, India	2019-20	*Rabi*	*Kufri Pukhraj*	8.36	-	Ojah and Bhattacharjee, (2022)
South 24 Parganas District, West Bengal, India	2016-2020	*Rabi*	*Kufri Pukhraj*	22.4-41.5	2.17	Sarangi et al. (2024)
ICAR-Central Potato Research Station RS, Gwalior (M.P.), India	2021-22 and 2022-23	*Rabi*	KCM	37.48	2.50	Parihar et al. (2024)
BCKV, Nadia, West Bengal, India	2006-2007	*Rabi*	*Kufri Jyoti*	8.36	-	Chettri & Goswami, (2018)
Khulna University, Bangladesh	2021-22	*Rabi*	*BARI Alu 78*	23.74	1.93	Saimon et al. (2024)

Supplementary Table 4: Comparisons between the different experimental sites.

Sites	*Average (kg/ha)*	*Variance*	*F*	*P-value*	*F crit (P≤0.05)*	*Significant*
Rabi 2022						
Satjelia	12276.73	28173228.8	0.24	0.62	3.94	NS
Chotomollakhali	12846.10	35219659.7				
Rabi 2023						
Chotomollakhali	9965.28	22737152.78	1.94	0.15	3.11	NS
Satjelia	8958.33	23269642.86				
Rangabelia	7205.36	4157709.48				

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