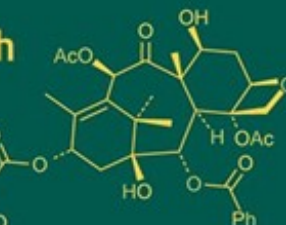


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Development and evaluation of compatible microbial consortia for accelerated degradation of heterogeneous crop residues and leaf litter

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ABSTRACT

Efficient decomposition of Agricultural crop residues requires microorganisms with complementary lignocellulolytic activities and compatibility when combined together. The present study evaluated compatibility among selected fungal and bacterial decomposers and assessed six microbial consortia for degradation of wheat straw, soybean straw, maize straw and tree leaf litter under controlled pot conditions. Eight fungal isolates viz., *Corynascus* sp. (P2), *Myrothecium* sp. (P3), *Aspergillus* spp. (P15, P18, P19, P24 and P29) and *Xenomyrothecium* sp. (P28) and three bacterial isolates including *Streptomyces* sp. (B2), *Bacillus* sp. (B5) and *Serratia* sp. (B10), were subjected to compatibility testing. Four compatible fungal pairs, one fungus-bacterium pair and one bacterial pair were identified, leading to six consortia. The pot experiment followed a completely randomized design with three replications, seven treatments and four substrates, comprising 84 pots in total. Substrates were chemically pretreated with 1% NaOH and sterilized before inoculation. *Microbial consortia* were applied at 10% (w/v) to 500 g substrate portions, with moisture maintained at approximately 60%. The three-member fungal consortium T4, consisting of *Corynascus* sp. (P2) + *Myrothecium* sp. (P3) + *Aspergillus* sp. (P24), recorded the highest 90 days substrate degradation rates: 75.87% in wheat straw, 82.40% in soybean straw, 78.73% in maize straw and 90.27% in leaf litter. T4 also showed the shortest time to the decomposition endpoint recorded (63, 54, 57 and 42 days, respectively). Final N, P and K concentrations were highest under T4, whereas organic carbon and C:N ratio declined during decomposition. Physical observations showed faster colour, odour and texture transformation under microbial treatments, particularly T4. The results indicate that compatible microbial consortia accelerated transformation of preconditioned heterogeneous residues under controlled conditions.

Keywords: Microbial consortium, Compatibility, Crop residue decomposition, Wheat straw, Soybean straw, Maize straw, Leaf litter, Lignocellulolytic microorganisms

1. Introduction

Agricultural residues are an important source of organic carbon and plant nutrients, and their efficient decomposition plays a significant role in nutrient recycling and sustainable residue management. Large quantities of rice, wheat and other crop residues are generated from intensive agricultural production, while their improper disposal, particularly open field burning, results in the loss of valuable organic resources and creates environmental concerns. Biological decomposition using efficient microorganisms offers an alternative approach for converting these residues into useful organic matter and facilitating their incorporation into soil (Choudhary *et al.*, 2016) [1].

The recalcitrant nature of crop residues is mainly associated with their complex lignocellulosic structure comprising cellulose, hemicellulose and lignin. Microorganisms capable of producing hydrolytic and oxidative enzymes can utilize these structural components and contribute to progressive residue breakdown. However, degradation of lignocellulose is a complex process involving several enzymatic activities and different microorganisms may possess different capacities for degrading particular components. Studies on wheat straw have demonstrated that microbial communities with different compositions can exhibit similar overall degradation ability while possessing distinct enzymatic profiles, indicating the importance of functional complementarity among microorganisms (Cortes-Tolalpa *et al.*, 2016) [2].

The use of microbial consortia can therefore provide an advantage over individual microbial inoculants by combining microorganisms with complementary degradative properties. However, the successful development of a consortium requires microorganisms that can coexist and maintain their functional activities without strong antagonistic interactions. This makes compatibility assessment an important preliminary step in consortium formulation. Choudhary *et al.* (2016) [1] identified efficient fungal isolates from rice and wheat

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fields and reported that compatible combinations of lignocellulolytic fungi showed potential for accelerating crop-residue degradation. Similarly, research on synthetic microbial consortia has shown that the composition and functional performance of a consortium can be influenced by the microorganisms selected and their interactions during lignocellulose degradation (Cortes-Tolalpa *et al.*, 2016; Puentes-Tellez *et al.*, 2018) [2, 3].

The efficiency of a microbial consortium may further depend on the type and chemical composition of the residue used as substrate. Wheat straw, maize straw, rice straw and leaf litter differ in their relative proportions of cellulose, hemicellulose, lignin and other organic constituents, and consequently may support different patterns of microbial degradation. Thus, evaluation of a consortium against multiple residues is necessary to determine whether its decomposing ability is broad or substrate-specific. Previous studies have primarily evaluated selected microorganisms or consortia against individual residues, particularly rice or wheat straw, highlighting the need for comparative assessment across diverse plant materials (Choudhary *et al.*, 2016; Cortes-Tolalpa *et al.*, 2016) [1, 2].

Although lignocellulolytic microorganisms and microbial consortia have been investigated extensively, systematic utilization of already available efficient isolates through compatibility testing, consortium development and comparative evaluation on diverse residues under pot conditions remains important. Therefore, the present study was undertaken (i) To assess the compatibility of selected microbial isolates, (ii) To formulate compatible microbial consortia and (iii) To evaluate their decomposition potential against wheat straw, maize straw, rice straw and leaf litter under pot culture conditions. The study is aimed at identifying effective microbial combinations with broad residue-decomposition potential and establishing their suitability for biological management of agricultural residues.

2. Materials and Methods

2.1 Selection of microbial isolates and compatibility testing

Eight fungal isolates (P2, P3, P15, P18, P19, P24, P28 and P29) and three bacterial isolates (B2, B5 and B10) were taken from Department of Plant Pathology, VNMKV, Parbhani. Compatibility was assessed using cross streak and dual culture assays as described by Dantoliya *et al.*, 2021 [4]. Bacterial combinations were evaluated by cross streaking on nutrient agar and incubation at 30-35 °C for 24 hrs. Fungal combinations were assessed on PDA using 8 mm discs from 7 days old cultures and incubated at approximately 27 ± 1 °C for 5 days. Fungal-bacterial interactions were assessed on modified PDA using a 5 mm fungal disc and bacterial streak, followed by incubation at 28 ± 2 °C. Absence of visible inhibition or antagonism was considered compatibility. All compatibility assays were performed in triplicate.

2.2 Consortium formulation

Six pairwise compatible microbial combinations were identified and used to formulate six consortia: three two member fungal consortia, one three-member fungal consortium, one fungal-bacterial consortium

and one bacterial consortium. For two member fungal consortia, equal volumes of compatible fungal inoculum were combined in a 1:1 (v/v) ratio and adjusted to approximately 1 × 10⁶ CFU ml⁻¹. For the three member fungal consortium T₄, comprising P2, P3 and P24, the compatible fungal inoculum were combined for consortium preparation. For the bacterial consortium, compatible bacterial suspensions were combined in a 1:1 ratio and standardized to approximately 1 × 10⁷ CFU ml⁻¹. For the fungus-bacterium consortium, fungal and bacterial suspensions were combined with sterile 4% (w/v) jaggery solution in a 1:1:2 (v/v/v) ratio and acclimatized for 4-6 hrs at 28 ± 2 °C. All preparations were carried out aseptically.

Treatment	Consortium
T ₁	<i>Corynascus</i> sp. (P2) + <i>Myrothecium</i> sp. (P3)
T ₂	<i>Myrothecium</i> sp. (P3) + <i>Aspergillus</i> sp. (P24)
T ₃	<i>Myrothecium</i> sp. (P3) + <i>Xenomyrothecium</i> sp. (P28)
T ₄	<i>Corynascus</i> sp. (P2) + <i>Myrothecium</i> sp. (P3) + <i>Aspergillus</i> sp. (P24)
T ₅	<i>Corynascus</i> sp. (P2) + <i>Bacillus</i> sp. (B5)
T ₆	<i>Bacillus</i> sp. (B5) + <i>Streptomyces</i> sp. (B2)
T ₇	Uninoculated control

2.3 Pot culture experiment

The decomposition experiment was conducted separately for wheat straw, soybean straw, maize straw and tree leaf litter in a completely randomized design (CRD) with three replications. Each substrate had seven treatments, giving 21 pots per substrate and 84 pots in total. Substrates were chopped into 2-3 cm pieces, soaked in 1% NaOH at a substrate-to-solution ratio of 1:10 (w/v) for 24 hrs, washed with distilled water until neutral, dried at 80 °C for 6 hrs and autoclaved at 121 °C for 20 min. Five hundred grams of substrate were placed in 1 kg capacity pots. Microbial consortia were applied at 10% (v/w), mixed thoroughly and incubated under aseptic conditions. Moisture was maintained at approximately 60% using sterile water. An uninoculated control received the same substrate pretreatment but no microbial consortium.

2.4 Observations and analysis

Colour, odour and texture were recorded at fixed intervals, including the initial stage and 30, 60 and 90 days. Total nitrogen was estimated by Kjeldahl's method (Piper, 1966) [5], total phosphorus by the vanadomolybdate yellow colour method (Kitson *et al.*, 1944) [6], potassium using a flame photometer (Piper, 1966) [5] and organic carbon by the dry-combustion procedure (Nelson *et al.*, 1982) [7]. C:N ratio was calculated from organic carbon and nitrogen concentrations. The decomposition endpoint was recorded based on visible complete decomposition and stabilization of colour, odour, texture and nutrient parameters. Substrate degradation rate after 90 days was calculated as;

$$\frac{\text{initial substrate weight} - \text{residual substrate weight}}{\text{initial substrate weight}} \times 100$$

Statistical analysis

Data were analyzed using analysis of variance as outlined by Gomez *et al.* (1984) [8] and OPSTAT software. When the *F*-test indicated significant treatment effects, treatment means were compared using

Critical Difference (CD) @ 1% level. SE(m) ± and CD values with the corresponding results.

Initial substrate characterization

Substrates	Initial N (%)	Initial P (%)	Initial K (%)	Initial organic C (%)	Initial C:N
Wheat straw	0.57	0.09	0.94	44.60	78.25
Soybean straw	0.61	0.22	1.11	39.57	64.87

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Substrates	Initial N (%)	Initial P (%)	Initial K (%)	Initial organic C (%)	Initial C:N
Maize straw	0.50	0.13	0.70	45.78	91.56
Leaf litter	0.92	0.19	1.22	49.47	53.77

3. Results and Discussion

3.1 Compatibility and consortium selection

Among 28 fungal-fungal combinations tested, four were found compatible; P2 × P3, P2 × P24, P3 × P24 and P3 × P28. The remaining 24 fungal combinations showed inhibition, overgrowth or contact-point inhibition. Among 24 bacteria-fungi interactions, only B5 × P2 was

compatible. B2 and B10 were incompatible with all tested fungal isolates, while B5 was incompatible with fungal isolates other than P2. Among the three bacterial pairs, B2 × B5 was compatible, whereas B2 × B10 and B5 × B10 were incompatible. These compatibility results provided the basis for constructing the consortia evaluated in the pot experiment. Compatibility-based selection is consistent with the principle that microbial members of a consortium should be able to coexist without strong antagonistic interactions (Chen *et al.*, 2024) [9].

Fungi-fungi	Observation	Bacteria-fungi	Observation	Bacteria-bacteria	Observation
P2 × P3	Compatible	B2 × P2	Incompatible	B2 × B5	Compatible
P2 × P15	Incompatible	B2 × P3	Incompatible	B2 × B10	Incompatible
P2 × P18	Incompatible	B2 × P15	Incompatible	B5 × B10	Incompatible
P2 × P19	Incompatible	B2 × P18	Incompatible		
P2 × P24	Compatible	B2 × P19	Incompatible		
P2 × P28	Incompatible	B2 × P24	Incompatible		
P2 × P29	Incompatible	B2 × P28	Incompatible		
P3 × P15	Incompatible	B2 × P29	Incompatible		
P3 × P18	Incompatible	B5 × P2	Compatible		
P3 × P19	Incompatible	B5 × P3	Incompatible		
P3 × P24	Compatible	B5 × P15	Incompatible		
P3 × P28	Compatible	B5 × P18	Incompatible		
P3 × P29	Incompatible	B5 × P19	Incompatible		
P15 × P18	Incompatible	B5 × P24	Incompatible		
P15 × P19	Incompatible	B5 × P28	Incompatible		
P15 × P24	Incompatible	B5 × P29	Incompatible		
P15 × P28	Incompatible	B10 × P2	Incompatible		
P15 × P29	Incompatible	B10 × P3	Incompatible		
P18 × P19	Incompatible	B10 × P15	Incompatible		
P18 × P24	Incompatible	B10 × P18	Incompatible		
P18 × P28	Incompatible	B10 × P19	Incompatible		
P18 × P29	Incompatible	B10 × P24	Incompatible		
P19 × P24	Incompatible	B10 × P28	Incompatible		
P19 × P28	Incompatible	B10 × P29	Incompatible		
P19 × P29	Incompatible				
P24 × P28	Incompatible				
P24 × P29	Incompatible				
P28 × P29	Incompatible				

3.2 Physical transformation during decomposition

Across all four substrates, microbial treatments produced faster visible transformation than the uninoculated, pretreated control. Residues progressively changed in colour, odour and texture during the 90-day period. T₄ showed particularly rapid transformation, with advanced darkening, reduced characteristic odour and development of crumbly

or humus-like texture in several substrates. These observations were qualitative and were not treated as an independent quantitative maturity score. Similar changes in physical characteristics and accelerated organic matter transformation following microbial inoculation have been reported during consortium-based decomposition studies (Awasthi *et al.*, 2014; Beary *et al.*, 2002) [10, 11].

3.3 Nitrogen transformation

Treatment	Wheat final N concentration (%)	Soybean final N concentration (%)	Maize final N concentration (%)	Leaf litter final N concentration (%)
T ₁	1.26	1.29	0.79	1.12
T ₂	1.38	1.54	1.2	1.35
T ₃	0.92	1.06	0.95	1.4
T ₄	1.53	1.67	1.23	1.71
T ₅	1.15	1.07	0.65	1.03

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Treatment	Wheat final N concentration (%)	Soybean final N concentration (%)	Maize final N concentration (%)	Leaf litter final N concentration (%)
T ₆	0.75	1.2	0.87	1.26
T ₇	0.64	0.85	0.57	0.95
Se (m) ±	0.02	0.02	0.02	0.02
CD @ 1%	0.05	0.07	0.07	0.05

Final nitrogen concentration was higher than the initial concentration in all four substrates, with the magnitude varying among treatments. T₄ recorded the highest numerical final nitrogen concentration in each substrate: 1.53% in wheat straw, 1.67% in soybean straw, 1.23% in maize straw and 1.71% in leaf litter. The increase in percentage concentration should be interpreted primarily as a concentration effect associated with decomposition and loss of carbon-rich material, rather than as proof of an increase in total nitrogen mass. Microbial inoculation has similarly been reported to influence nitrogen retention and nitrogen concentration during straw composting (Zhou *et al.*, 2023) [12].

3.4 Phosphorus transformation

Final phosphorus concentration was higher than the initial value in all four substrates. T₄ recorded the highest final phosphorus concentrations: 0.22% in wheat straw, 0.49% in soybean straw, 0.35% in maize straw and 0.45% in leaf litter. These values represent concentrations in the remaining decomposed material and should not be interpreted as a net increase in total phosphorus mass without a nutrient mass balance. Phosphorus release during residue decomposition is known to vary with residue composition and decomposition conditions (Lupwayi *et al.*, 2007) [13], while recent consortium studies have also demonstrated changes in straw degradation and phosphorus transformation following microbial inoculation (Che *et al.*, 2024) [14].

Treatment	Wheat final P concentration (%)	Soybean final P concentration (%)	Maize final P concentration (%)	Leaf litter final P concentration (%)
T ₁	0.12	0.27	0.24	0.26
T ₂	0.16	0.31	0.19	0.28
T ₃	0.11	0.29	0.19	0.25
T ₄	0.22	0.49	0.35	0.45
T ₅	0.14	0.38	0.22	0.32
T ₆	0.18	0.43	0.31	0.38
T ₇	0.11	0.24	0.16	0.23
Se (m) ±	0.005	0.007	0.006	0.005
CD @ 1%	0.017	0.023	0.018	0.016

3.5 Potassium transformation

Treatment	Wheat final K concentration (%)	Soybean final K concentration (%)	Maize final K concentration (%)	Leaf litter final K concentration (%)
T ₁	1.23	1.24	1.29	1.32
T ₂	1.36	1.49	1.18	1.46
T ₃	1.13	1.38	1.11	1.4
T ₄	1.44	1.64	1.38	1.78
T ₅	1.13	1.26	0.94	1.32
T ₆	1.22	1.31	1.22	1.35
T ₇	0.99	1.17	0.75	1.27
Se (m) ±	0.02	0.02	0.02	0.02
CD @ 1%	0.07	0.05	0.06	0.05

Final potassium concentration increased under most microbial treatments. T₄ recorded the highest final potassium concentrations across all four substrates: 1.44% in wheat straw, 1.64% in soybean straw, 1.38% in maize straw and 1.78% in leaf litter. The observed increases are best described as changes in concentration of the residual material. Potassium is relatively mobile during residue decomposition, and

rapid K release from decomposing straw has been reported previously (Li *et al.*, 2014) [15]. Field studies have also shown that residue type and decomposition environment influence nutrient release during residue decomposition (Mishra *et al.*, 2024) [16].

3.6 Organic carbon transformation

Treatments	Wheat final OC (%)	Soybean final OC (%)	Maize final OC (%)	Leaf litter final OC (%)
T ₁	35.43	32.72	37.2	41.56
T ₂	36.51	34.24	39.26	44.21
T ₃	39.05	35.86	32.71	40.96
T ₄	30.93	29.38	35.39	39.87
T ₅	28.97	23.78	29.92	32.57

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Treatments	Wheat final OC (%)	Soybean final OC (%)	Maize final OC (%)	Leaf litter final OC (%)
T ₆	32.31	26.18	32.75	34.3
T ₇	41.16	37.51	41.9	46.26
Se (m) ±	0.52	0.42	0.51	0.52
CD @ 1%	1.60	1.30	1.55	1.58

Organic carbon concentration decreased during decomposition in all inoculated treatments. T₅ recorded the lowest final organic carbon concentration in all four substrates; 28.97% in wheat straw, 23.78% in soybean straw, 29.92% in maize straw and 32.57% in leaf litter. T₄ recorded 30.93%, 29.38%, 35.39% and 39.87% Organic carbon content, respectively, whereas the uninoculated control retained the high-

est final organic carbon concentrations in all substrates. The decline in organic carbon is consistent with microbial utilization and mineralization of organic substrates during decomposition; lignocellulolytic consortia have similarly been shown to accelerate carbon transformation in crop residues (Bhattacharya *et al.*, 2021) [17].

3.7 C:N ratio

Treatments	Wheat final C:N	Soybean final C:N	Maize final C:N	Leaf litter final C:N
T ₁	28.12	25.31	46.91	37.01
T ₂	26.51	22.28	32.72	32.75
T ₃	42.3	33.73	34.32	29.26
T ₄	20.25	17.56	28.84	23.36
T ₅	25.26	22.22	45.82	31.71
T ₆	43.08	21.82	37.64	27.29
T ₇	64.62	44.13	73.89	48.54
Se (m) ±	0.77	0.71	0.97	0.42
CD @ 1%	2.36	2.19	2.97	1.29

The C:N ratio declined substantially during decomposition. T₄ recorded the lowest final C:N ratio in wheat straw (20.25), soybean straw (17.56), maize straw (28.84) and leaf litter (23.36), compared with initial ratios of 78.25, 64.87, 91.56 and 53.77, respectively. The pretreated uninoculated control retained higher final ratios of 64.62, 44.13, 73.89 and 48.54. The decline in C:N ratio reflects transforma-

tion and loss of carbon-rich material together with relative retention of nitrogen in the residual material. Changes in C:N ratio during microbial residue decomposition have also been documented during straw composting (Zhou *et al.*, 2023; Awasthi *et al.*, 2014) [12, 10].

3.8 Time required to reach the decomposition endpoint

Treatments	Wheat (days)	Soybean (days)	Maize (days)	Leaf litter (days)
T ₁	87	76	80	71
T ₂	82	64	76	74
T ₃	74	67	70	48
T ₄	63	54	57	42
T ₅	78	63	68	64
T ₆	68	59	62	51
T ₇	89	86	88	80

The recorded the time required to reach its decomposition endpoint based on visible complete decomposition and stabilization of colour, odour, texture and nutrient parameters. Under this endpoint criterion, T₄ required 63 days for wheat straw, 54 days for soybean straw, 57 days for maize straw and 42 days for leaf litter. Because these end-

point times were based on visible criteria and not on direct repeated gravimetric measurements of mass loss, they should not be interpreted as direct measurements of 80% gravimetric degradation.

3.9 Degradation rate (%) after 90 days

Treatments	Wheat degradation rate (%)	Soybean degradation rate (%)	Maize degradation rate (%)	Leaf litter degradation rate (%)
T ₁	34.6	38.93	32.87	37.6
T ₂	44.87	49.8	42.2	53.2
T ₃	67.13	77.0	51.73	80.0
T ₄	75.87	82.4	78.73	90.27
T ₅	39.8	44.96	39.67	37.73
T ₆	52.53	61.76	51.6	67.73
T ₇	22.67	29.73	20.47	31.13
Se (m) ±	1.47	1.27	1.19	1.18
CD @ 1%	4.53	3.89	3.64	3.60

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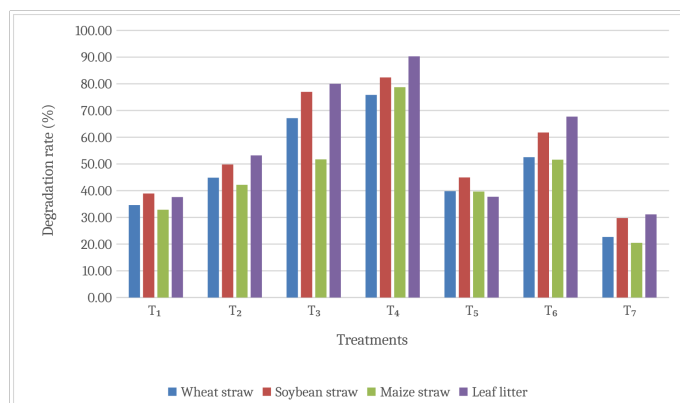


Figure 1. Effect of microbial consortia on degradation rate (%) of different substrates

After 90 days, T₄ recorded the highest substrate degradation rate in every substrate: 75.87% in wheat straw, 82.40% in soybean straw, 78.73% in maize straw and 90.27% in leaf litter. The corresponding final residual weights under T₄ were 120.67, 88.00, 106.33 and 48.67 g from an initial 500 g, while the uninoculated control (T₇) recorded 22.67%, 29.73%, 20.47% and 31.13% degradation, respectively. Fig. 1 shows the variation in degradation rate among consortia inoculated substrates and uninoculated control. The common chemical pretreatment means that the absolute 90 days mass reduction includes a contribution from preconditioning, whereas the treatment comparison is made against the identically uninoculated control (T₇). The higher degradation observed under T₄ is consistent with previous reports of enhanced residue breakdown following application of compatible or functionally complementary microbial consortia (Sharma *et al.*, 2022; Che *et al.*, 2024; Chen *et al.*, 2024) [18, 14, 9].

4. Conclusion

Compatibility testing demonstrated that microbial interactions were highly combination dependent. Six compatible combinations were selected to construct microbial consortia. Under controlled pot conditions, the three-member fungal consortium T₄ (*Corynascus* sp. P2 + *Myrothecium* sp. P3 + *Aspergillus* sp. P24) consistently produced the highest 90 days substrate degradation rates, rapid physical transformation and the highest final N, P and K concentrations across the four substrates. Treatment T₅ showed the greatest reduction in final organic carbon in several substrates, whereas T₄ recorded the lowest final C:N ratio across all four substrates. The time to endpoint values reported were shortest under T₄, but these endpoint times were based on visible criteria. The study identifies T₄ as the leading consortium under the controlled experimental conditions and supports its further evaluation under field conditions.

References

- Choudhary M, Sharma PC, Jat HS, Nehra V, McDonald AJ, Garg N. Crop residue degradation by fungi isolated from conservation agriculture fields under rice–wheat system of North-West India. *International Journal of Recycling of Organic Waste in Agriculture*. 2016;5:349–360.
- Cortes-Tolalpa L, Jimenez DJ, de Lima Brossi MJ, Salles JF, van Elsas JD. Different inocula produce distinctive microbial consortia with similar lignocellulose degradation capacity. *Applied Microbiology and Biotechnology*. 2016;100:7713–7725.
- Puentes-Tellez PE, Falcao Salles J. Construction of effective minimal active microbial consortia for lignocellulose degradation. *Microbial Ecology*. 2018;76:419–429.

- Dantoliya S, Joshi C, Mohapatra A, Shah D, Bhargava P, Bhanushali S, Pandit R, Joshi C, Joshi M. Creating wealth from waste: An approach for converting organic waste in to value-added products using microbial consortia. *Environmental Technology and Innovation*. 2021;25:102092.
- Piper CS. Soil and plant analysis: A laboratory manual of methods for the examination of soils and the determination of the inorganic constituents of plants. Hans Publishers. 1966.
- Kitson RE, Mellon MG. Colorimetric determination of phosphorus as molybdivanadophosphoric acid. *Industrial & Engineering Chemistry Analytical Edition*. 1944;16(6):379–383.
- Nelson DW, Sommers LE. Total carbon, organic carbon, and organic matter. In Page AL, editor. *Methods of soil analysis: Part 2. Chemical and microbiological properties* (2nd ed.). American Society of Agronomy and Soil Science Society of America. 1982.
- Gomez KA, Gomez AA. Statistical procedures for agricultural research (2nd ed.). John Wiley & Sons. 1984.
- Chen L, Tang T, Wang Z, Zhao N, Wu S, Liu Y. A novel fungal and bacterial consortium promotes the degradation of rice straw: Conditions optimization and degradation properties. *International Biodeterioration & Biodegradation*. 2024;194:105875.
- Awasthi MK, Pandey AK, Khan J, Bundela PS, Wong JWC, Selvam A. Evaluation of thermophilic fungal consortium for organic municipal solid waste composting. *Bioresource Technology*. 2014;168:214–221.
- Beary TP, Boopathy R, Templet P. Accelerated decomposition of sugarcane crop residue using a fungal–bacterial consortium. *International Biodeterioration & Biodegradation*. 2002;50(1):41–46.
- Zhou L, Xie Y, Wang X, Li P, Liu Y, Wang Z, Dai J, Zhang H, Yang X. Influence of different microbial inoculants on nitrogen retention and diazotroph community succession during cotton straw composting. *Process Safety and Environmental Protection*. 2023;172:882–893.
- Lupwayi NZ, Clayton GW, Donovan JT, Harker KN, Turkington TK, Soon YK. Phosphorus release during decomposition of crop residues under conventional and zero tillage. *Soil and Tillage Research*. 2007;95(1–2):231–239.
- Che S, Xu Y, Qin X, Tian S, Wang J, Zhou X, Cao Z, Wang D, Wu M, Wu Z, Yang M, Wu L, Yang X. Building microbial consortia to enhance straw degradation, phosphorus solubilization and soil fertility for rice growth. *Microbial Cell Factories*. 2024;23:232.
- Li J, Lu J, Li X, Ren T, Cong R, Zhou L. Dynamics of potassium release and adsorption on rice straw residue. *PLOS ONE*. 2014;9(2):e90440.
- Mishra AK, Shinjo H, Jat HS, Jat ML, Jat RK, Funakawa S. Assessing the impact of rice-wheat-maize residue decomposition rate and nutrient dynamics of residue and soil using different placement method in the IGP of India. *Frontiers in Sustainable Food Systems*. 2024;8:1409370.
- Bhattacharya S, Sahu A, Phalke DH, Manna MC, Thakur JK, Mandal A, Tripathi AK, Sheoran P, Choudhary M, Bhowmick A, Rahman MM, Naidu R, Patra AK. In situ decomposition of crop residues using lignocellulolytic microbial consortia: A viable alternative to residue burning. *Environmental Science and Pollution Research*. 2021;28:20713–20724.
- Sharma S, Kumawat KC, Kaur S. Potential of indigenous lignocellulolytic microbial consortium to accelerate degradation of heterogeneous crop residues. *Environmental Science and Pollution Research*. 2022;29(58):88331–88346.
- Sharma S, Kumawat KC, Kaur P, Kaur S, Gupta N. Crop residue heterogeneity: Decomposition by potential indigenous lignocellulolytic microbes and enzymatic profiling. *Current Research in Microbial Sciences*. 2024;6:100227.

20. Shinde R, Shahi DK, Mahapatra P, Naik SK, Thombare N, Singh AK. Potential of lignocellulose degrading microorganisms for agricultural residue decomposition in soil: A review. *Journal of Environmental Management*. 2022;320:115843.

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