

**Supplementary Table 1.** Geographical locations from where rhizobacterial strains were isolated.

| <b>S.No.</b> | <b>Isolate</b> | <b>Locations</b>                                       | <b>Coordinates</b>                  | <b>Year of isolation</b> |
|--------------|----------------|--------------------------------------------------------|-------------------------------------|--------------------------|
| <b>1.</b>    | CHW-12         | Barhani, Chandauli, Uttar Pradesh (India)              | 25° 17' 29.976" N 83° 24' 25.74" E  | <b>2017</b>              |
| <b>2.</b>    | ABW-30         | Baskhari, Ambedkar Nagar, Uttar Pradesh (India)        | 26° 27' 8.586" N 82° 46' 50.0016" E | <b>2018</b>              |
| <b>3.</b>    | CHW-21         | Chakia, Chandauli, Uttar Pradesh (India)               | 25° 2' 48.84" N 83° 13' 3.7092" E   | <b>2017</b>              |
| <b>4.</b>    | JNW-2          | Badalapur, Jaunpur, Uttar Pradesh (India)              | 25° 53' 34.908" N 82° 27' 10.62" E  | <b>2018</b>              |
| <b>5.</b>    | VAW-19         | Raja Talab, Varanasi, Uttar Pradesh (India)            | 27° 6' 0.756" N 80° 53' 20.04" E    | <b>2018</b>              |
| <b>6.</b>    | ABW-43         | Ramnagar, Ambedkar Nagar, Uttar Pradesh (India)        | 28° 39' 41.616" N 77° 26' 9.3156" E | <b>2018</b>              |
| <b>7.</b>    | ABW-46         | Ramnagar, Ambedkar Nagar, Uttar Pradesh (India)        | 28° 39' 41.616" N 77° 26' 9.3156" E | <b>2018</b>              |
| <b>8.</b>    | CHW-4          | Barhani, Chandauli, Uttar Pradesh (India)              | 25° 17' 29.976" N 83° 24' 25.74" E  | <b>2017</b>              |
| <b>9.</b>    | JNW-23         | Sivatha, Jaunpur, Uttar Pradesh (India)                | 25° 45' 17.64" N 82° 41' 13.416" E  | <b>2018</b>              |
| <b>10.</b>   | BLW-7          | Kalikthan, Balrampur Uttar Pradesh (India)             | 27° 25' 3.36" N 82° 10' 10.56" E    | <b>2017</b>              |
| <b>11.</b>   | ABW-17         | Akabarpur, Ambedkar Nagar, Uttar Pradesh (India)       | 26° 26' 33.864" N 82° 40' 51.132" E | <b>2018</b>              |
| <b>12.</b>   | SNW-27         | Chopan, Sonbhadra, Uttar Pradesh (India)               | 24° 30' 42.12" N 83° 1' 29.28" E    | <b>2018</b>              |
| <b>13.</b>   | CHW-16         | Chakia, Chandauli, Uttar Pradesh (India)               | 25° 2' 48.84" N 83° 13' 3.7092" E   | <b>2017</b>              |
| <b>14.</b>   | CHW-2          | Barhani, Chandauli, Uttar Pradesh (India)              | 25° 17' 29.976" N 83° 24' 25.74" E  | <b>2017</b>              |
| <b>15.</b>   | MJW-46         | Khamhhariya, Mirzapur ,Uttar Pradesh (India)           | 25° 13' 33.96" N 82° 39' 34.92" E   | <b>2018</b>              |
| <b>16.</b>   | ABW-59         | Tanda, Ambedkar Nagar, Uttar Pradesh (India)           | 26° 32' 35.88" N 82° 39' 52.2" E    | <b>2018</b>              |
| <b>17.</b>   | CHW-19         | Chakia, Chandauli, Uttar Pradesh (India)               | 25° 2' 48.84" N 83° 13' 3.7092" E   | <b>2017</b>              |
| <b>18.</b>   | MJW-48         | Khamhhariya, Mirzapur ,Uttar Pradesh (India)           | 25° 13' 33.96" N 82° 39' 34.92" E   | <b>2018</b>              |
| <b>19.</b>   | MJW-43         | Khamhhariya, Mirzapur ,Uttar Pradesh (India)           | 25° 13' 33.96" N 82° 39' 34.92" E   | <b>2018</b>              |
| <b>20.</b>   | ABW-54         | Tanda, Ambedkar Nagar, Uttar Pradesh (India)           | 26° 32' 35.88" N 82° 39' 52.2" E    | <b>2018</b>              |
| <b>21.</b>   | CHW-25         | Kathawal, Sakaldeeha, Chandauli, Uttar Pradesh (India) | 25° 15' 39.6" N 83° 15' 35.64" E    | <b>2017</b>              |
| <b>22.</b>   | SNW-26         | Chopan, Sonbhadra, Uttar Pradesh (India)               | 24° 30' 42.12" N 83° 1' 29.28" E    | <b>2018</b>              |

|            |        |                                                        |                                     |             |
|------------|--------|--------------------------------------------------------|-------------------------------------|-------------|
| <b>23.</b> | ABW-58 | Tanda, Ambedkar Nagar, Uttar Pradesh (India)           | 26° 32' 35.88" N 82° 39' 52.2" E    | <b>2018</b> |
| <b>24.</b> | CHW-15 | Chakia, Chandauli, Uttar Pradesh (India)               | 25° 2' 48.84" N 83° 13' 3.7092" E   | <b>2017</b> |
| <b>25.</b> | CHW-10 | Barhani, Chandauli, Uttar Pradesh (India)              | 25° 17' 29.976" N 83° 24' 25.74" E  | <b>2017</b> |
| <b>26.</b> | CHW-22 | Kathawal, Sakaldeeha, Chandauli, Uttar Pradesh (India) | 25° 15' 39.6" N 83° 15' 35.64" E    | <b>2017</b> |
| <b>27.</b> | JNW-11 | Badalapur, Jaunpur, Uttar Pradesh (India)              | 25° 52' 58.8" N 82° 27' 5.76" E     | <b>2018</b> |
| <b>28.</b> | ABW-16 | Akabarpur, Ambedkar Nagar, Uttar Pradesh (India)       | 26° 26' 33.864" N 82° 40' 51.132" E | <b>2018</b> |
| <b>29.</b> | ABW-53 | Tanda, Ambedkar Nagar, Uttar Pradesh (India)           | 26° 32' 35.88" N 82° 39' 52.2" E    | <b>2018</b> |
| <b>30.</b> | ABW-15 | Akabarpur, Ambedkar Nagar, Uttar Pradesh (India)       | 26° 26' 33.864" N 82° 40' 51.132" E | <b>2018</b> |
| <b>31.</b> | JNW-1  | Badalapur, Jaunpur, Uttar Pradesh (India)              | 25° 52' 58.8" N 82° 27' 5.76" E     | <b>2018</b> |
| <b>32.</b> | VAW-3  | Raja Talab, Varanasi, Uttar Pradesh (India)            | 27° 6' 0.756" N 80° 53' 20.04" E    | <b>2017</b> |
| <b>33.</b> | MJW-38 | Tilthi, Kon, Mirzapur, Uttar Pradesh (India)           | 25° 7' 17.436" N 82° 33' 48.42" E   | <b>2018</b> |
| <b>34.</b> | JNW-7  | Badalapur, Jaunpur, Uttar Pradesh (India)              | 25° 52' 58.8" N 82° 27' 5.76" E     | <b>2018</b> |
| <b>35.</b> | AJW-3  | Mahrajganj, Ajaigarh, Uttar Pradesh (India)            | 26° 26' 26.052" N 82° 32' 45.276" E | <b>2017</b> |
| <b>36.</b> | CHW-1  | Barhani, Chandauli, Uttar Pradesh (India)              | 25° 17' 29.976" N 83° 24' 25.74" E  | <b>2017</b> |
| <b>37.</b> | BLW-47 | Tulsipur, Balrampur, Uttar Pradesh (India)             | 27° 31' 28.56" N 82° 24' 56.52" E   | <b>2017</b> |
| <b>38.</b> | BAW-33 | Mahsi, Baharaiech, Uttar Pradesh (India)               | 27° 38' 17.52" N 81° 22' 2.64" E    | <b>2017</b> |
| <b>39.</b> | BLW-67 | Pachperwa, Balrampur, Uttar Pradesh (India)            | 27° 31' 5.52" N 82° 38' 45.96" E    | <b>2017</b> |
| <b>40.</b> | SKW-18 | Nathan Nagar, Sant Kabir Nagar, Uttar Pradesh (India)  | 26° 38' 34.08" N 83° 1' 33.96" E    | <b>2017</b> |
| <b>41.</b> | MHW-25 | Paratwal, Maharaj Ganj, Uttar Pradesh (India)          | 26° 58' 5.88" N 83° 36' 5.76" E     | <b>2017</b> |
| <b>42.</b> | STW-46 | Lambhua, Sultanpur, Uttar Pradesh (India)              | 26° 8' 25.08" N 82° 13' 37.56" E    | <b>2017</b> |

**Supplementary Table 2.** Zinc solubilizing ability of bacterial isolates on three zinc complex media

| S.No | Isolates      | ZnCO <sub>3</sub> | ZnO          | Zn <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub> |
|------|---------------|-------------------|--------------|-------------------------------------------------|
| 1    | CHW-12        | 10 mm             | 12 mm        | 13 mm                                           |
| 2    | <b>AJW-3</b>  | <b>18 mm</b>      | <b>15 mm</b> | <b>26 mm</b>                                    |
| 3    | CHW-21        | -                 | 12 mm        | -                                               |
| 4    | JNW-2         | -                 | -            | 20 mm                                           |
| 5    | <b>ABW-30</b> | <b>20 mm</b>      | <b>22 mm</b> | <b>24 mm</b>                                    |
| 6    | ABW-43        | -                 | 14 mm        | -                                               |
| 7    | ABW-46        | -                 | 20 mm        | 14 mm                                           |
| 8    | CHW-4         | 11 mm             | 16mm         | -                                               |
| 9    | JNW-23        | 16 mm             | -            | 18 mm                                           |
| 10   | JNW-11        | 10 mm             | 15mm         | 12 mm                                           |
| 11   | ABW-17        | -                 | 18 mm        | -                                               |
| 12   | SNW-27        | -                 | -            | 15 mm                                           |
| 13   | CHW-16        | -                 | 15 mm        | 10 mm                                           |
| 14   | MJW-46        | -                 | -            | 15 mm                                           |
| 15   | <b>CHW-2</b>  | <b>22 mm</b>      | <b>20 mm</b> | <b>30 mm</b>                                    |
| 16   | ABW-59        | 10 mm             | 17 mm        | -                                               |
| 17   | CHW-19        | -                 | 10 mm        | 14 mm                                           |
| 18   | MJW-48        | -                 | -            | 13 mm                                           |
| 19   | MJW-43        | -                 | -            | 18 mm                                           |
| 20   | ABW-54        | 12 mm             | 21 mm        | -                                               |
| 21   | CHW-25        | -                 | 12 mm        | 15 mm                                           |
| 22   | SNW-26        | -                 | -            | 17 mm                                           |
| 23   | <b>CHW-22</b> | <b>16 mm</b>      | <b>14 mm</b> | <b>28 mm</b>                                    |
| 24   | CHW-15        | -                 | 15 mm        | 12 mm                                           |
| 25   | <b>MJW-38</b> | <b>24 mm</b>      | <b>16 mm</b> | <b>26 mm</b>                                    |
| 26   | ABW-58        | 11 mm             | 22 mm        | -                                               |
| 27   | <b>BLW-7</b>  | <b>15 mm</b>      | <b>18 mm</b> | <b>24 mm</b>                                    |
| 28   | ABW-16        | -                 | 15mm         | 20 mm                                           |
| 29   | ABW-53        | -                 | 13mm         | 13 mm                                           |
| 30   | ABW-15        | 14 mm             | 18 mm        | -                                               |
| 31   | JNW-1         | -                 | -            | 12 mm                                           |
| 32   | VAW-3         | -                 | 12mm         | 18 mm                                           |
| 33   | CHW-10        | 13mm              | -            | 17 mm                                           |
| 34   | JNW-7         | -                 | 15 mm        | 12 mm                                           |
| 35   | VAW-19        | -                 | -            | 14 mm                                           |
| 36   | CHW-1         | -                 | -            | 13 mm                                           |
| 37   | BLW-47        | -                 | -            | 22 mm                                           |
| 38   | BAW-33        | -                 | -            | 24 mm                                           |
| 39   | BLW-67        | -                 | -            | 20 mm                                           |
| 40   | SKW-18        | 12 mm             | -            | -                                               |
| 41   | MHW-25        | -                 | -            | 22 mm                                           |
| 42   | STW-46        | 11 mm             | 12 mm        | 14 mm                                           |

**Supplementary Table 3.** Bacterial isolates identified by 16S rRNA gene sequencing with their accession numbers

| S.No | Strain | Sequence Length | Completeness (%) | E Value | Similarity | Sequence ID | Accession Number | Identified As                            |
|------|--------|-----------------|------------------|---------|------------|-------------|------------------|------------------------------------------|
| 1    | CHW-12 | 1487            | 100              | 0.0     | 100        | SUB11613253 | ON763228         | <i>Brevibacillus agri</i>                |
| 2    | ABW-30 | 1483            | 100              | 0.0     | 100        | SUB11613253 | ON763229         | <i>Bacillus subtilis</i>                 |
| 3    | CHW-21 | 1440            | 100              | 0.0     | 100        | SUB11613253 | ON763230         | <i>Sphingobacterium kitahiroshimense</i> |
| 4    | JNW-2  | 1516            | 100              | 0.0     | 100        | SUB11613253 | ON763231         | <i>Advenella kashmirensis</i>            |
| 5    | VAW-19 | 1511            | 100              | 0.0     | 100        | SUB11613253 | ON763232         | <i>Bacillus xiamenensis</i>              |
| 6    | ABW-43 | 1554            | 100              | 0.0     | 100        | SUB11613253 | ON763233         | <i>Bacillus thuringiensis</i>            |
| 7    | ABW-46 | 1534            | 100              | 0.0     | 100        | SUB11613253 | ON763234         | <i>Alcaligenes faecalis</i>              |
| 8    | CHW-4  | 1508            | 100              | 0.0     | 100        | SUB11613253 | ON763235         | <i>Bacillus altitudinis</i>              |
| 9    | JNW-23 | 1508            | 100              | 0.0     | 100        | SUB11613253 | ON763236         | <i>Oceanobacillus caeni</i>              |
| 10   | BLW-7  | 1511            | 100              | 0.0     | 100        | SUB11613253 | ON763237         | <i>Bacillus xiamenensis</i>              |
| 11   | ABW-17 | 1498            | 100              | 0.0     | 100        | SUB11613253 | ON763238         | <i>Paenibacillus glucanolyticus</i>      |
| 12   | SNW-27 | 1458            | 100              | 0.0     | 100        | SUB11613253 | ON763239         | <i>Alcaligenes faecalis</i>              |
| 13   | CHW-16 | 1544            | 100              | 0.0     | 100        | SUB11613253 | ON763240         | <i>Advenella kashmirensis</i>            |
| 14   | CHW-2  | 1479            | 100              | 0.0     | 100        | SUB11613253 | ON763241         | <i>Brevibacillus borstelensis</i>        |
| 15   | MJW-46 | 1544            | 100              | 0.0     | 100        | SUB11613253 | ON763242         | <i>Advenella kashmirensis</i>            |
| 16   | ABW-59 | 1544            | 100              | 0.0     | 100        | SUB11613253 | ON763243         | <i>Advenella kashmirensis</i>            |
| 17   | CHW-19 | 1491            | 100              | 0.0     | 100        | SUB11613253 | ON763244         | <i>Bacillus cereus</i>                   |
| 18   | MJW-48 | 1544            | 100              | 0.0     | 100        | SUB11613253 | ON763245         | <i>Advenella kashmirensis</i>            |
| 19   | MJW-43 | 1544            | 100              | 0.0     | 100        | SUB11613253 | ON763246         | <i>Advenella kashmirensis</i>            |
| 20   | ABW-54 | 1516            | 100              | 0.0     | 100        | SUB11613253 | ON763247         | <i>Advenella kashmirensis</i>            |
| 21   | CHW-25 | 1496            | 100              | 0.0     | 100        | SUB11613253 | ON763248         | <i>Brevibacterium aurantiacum</i>        |
| 22   | SNW-26 | 1506            | 100              | 0.0     | 100        | SUB11613253 | ON763249         | <i>Bacillus cereus</i>                   |
| 23   | ABW-58 | 1520            | 100              | 0.0     | 100        | SUB11613253 | ON763250         | <i>Bacillus wiedmannii</i>               |

|    |        |      |     |     |     |             |          |                                                              |
|----|--------|------|-----|-----|-----|-------------|----------|--------------------------------------------------------------|
| 24 | CHW-15 | 1544 | 100 | 0.0 | 100 | SUB11613253 | ON763251 | <i>Bacillus cereus</i>                                       |
| 25 | CHW-10 | 1440 | 100 | 0.0 | 100 | SUB11613253 | ON763252 | <i>Sphingobacterium<br/>kitahiroshimense</i>                 |
| 26 | CHW-22 | 1509 | 100 | 0.0 | 100 | SUB11613253 | ON763253 | <i>Bacillus megaterium</i> or <i>Priestia<br/>megaterium</i> |
| 27 | JNW-11 | 1516 | 100 | 0.0 | 100 | SUB11613253 | ON763254 | <i>Advenella kashmirensis</i>                                |
| 28 | ABW-16 | 1506 | 100 | 0.0 | 100 | SUB11613253 | ON763255 | <i>Bacillus cereus</i>                                       |
| 29 | ABW-53 | 1516 | 100 | 0.0 | 100 | SUB11613253 | ON763256 | <i>Advenella kashmirensis</i>                                |
| 30 | ABW-15 | 1508 | 100 | 0.0 | 100 | SUB11613253 | ON763257 | <i>Bacillus paramycoides</i>                                 |
| 31 | JNW-1  | 1516 | 100 | 0.0 | 100 | SUB11613253 | ON763258 | <i>Advenella kashmirensis</i>                                |
| 32 | VAW-3  | 1479 | 100 | 0.0 | 100 | SUB11613253 | ON763259 | <i>Brevibacillus borstelensis</i>                            |
| 33 | MJW-38 | 1515 | 100 | 0.0 | 100 | SUB11613253 | ON763260 | <i>Bacillus licheniformis</i>                                |
| 34 | JNW-7  | 1524 | 100 | 0.0 | 100 | SUB11613253 | ON763261 | <i>Brevibacillus borstelensis</i>                            |
| 35 | AJW-3  | 1524 | 100 | 0.0 | 100 | SUB11613253 | ON763262 | <i>Bacillus altitudinis</i>                                  |
| 36 | CHW-1  | 1490 | 100 | 0.0 | 100 | SUB11613253 | ON763263 | <i>Sphingobacterium<br/>kitahiroshimense</i>                 |
| 37 | BLW-47 | 1507 | 100 | 0.0 | 100 | SUB11613253 | ON763273 | <i>Bacillus tequilensis</i>                                  |
| 38 | BAW-33 | 1558 | 100 | 0.0 | 100 | SUB11613253 | ON763274 | <i>Bacillus flexus</i> or <i>Priestia flexa</i>              |
| 39 | BLW-67 | 1438 | 100 | 0.0 | 100 | SUB11613253 | ON763275 | <i>Bacillus paramycoides</i>                                 |
| 40 | SKW-18 | 1517 | 100 | 0.0 | 100 | SUB11613253 | ON763276 | <i>Bacillus cereus</i>                                       |
| 41 | MHW-25 | 1488 | 100 | 0.0 | 100 | SUB11613253 | ON763277 | <i>Bacillus tequilensis</i>                                  |
| 42 | STW-46 | 1514 | 100 | 0.0 | 100 | SUB11613253 | ON763278 | <i>Bacillus cereus</i>                                       |

**Supplementary Table 4:** *In vitro* characterization of rhizospheric bacteria on the basis of plant growth promotion attributes exhibited by selected isolates

| S.No | Strain | Plant growth promoting traits |     |           |     |             |     |         | Enzyme assay |         |         |          |        |           |
|------|--------|-------------------------------|-----|-----------|-----|-------------|-----|---------|--------------|---------|---------|----------|--------|-----------|
|      |        | K                             | P   | IAA ug/ml | ACC | Siderophore | HCN | Ammonia | Catalase     | Oxidase | Amylase | Protease | Lipase | Cellulase |
| 1    | AJW-3  | +++                           | +   | 7.16      | +   | +++         | +++ | -       | +            | -       | +       | +        | +      | ++        |
| 2    | ABW-30 | +                             | ++  | 6.43      | +   | +++         | -   | -       | +            | -       | ++      | -        | ++     | +         |
| 3    | CHW-2  | +++                           | +++ | 18.61     | +   | -           | ++  | ++      | +            | -       | +++     | +++      | -      | -         |
| 4    | MJW-22 | +++                           | +++ | 10.16     | -   | -           | +   | +++     | +            | -       | -       | +        | +      | -         |
| 5    | CHW-38 | +++                           | +   | 8.61      | -   | ++          | ++  | +       | +            | -       | -       | ++       | -      | ++        |
| 6    | BLW-7  | +++                           | +++ | 12.70     | -   | -           | -   | ++      | +            | -       | ++      | +        | +      | -         |

(+)= low activity; (++) =moderate activity; (+++) strong activity; (-) = no activity

**Supplementary Table 5. Results of principal component analysis.**

| Principal components         |               | Without zinc |       | Zinc applied |       |
|------------------------------|---------------|--------------|-------|--------------|-------|
|                              |               | PC1          | PC2   | PC1          | PC2   |
| Initial                      | Total         | 9.90         | 3.86  | 9.19         | 4.54  |
| eigen                        | % of Variance | 70.69        | 27.56 | 65.61        | 32.43 |
| values                       | Cumulative %  | 70.69        | 98.25 | 65.61        | 98.04 |
| Rotation                     | Total         | 7.74         | 6.02  | 7.80         | 5.92  |
| sums of                      | % of Variance | 55.28        | 42.97 | 55.75        | 42.30 |
| squared                      | Cumulative %  | 55.28        | 98.25 | 55.75        | 98.04 |
| loadings                     |               |              |       |              |       |
| Factor loadings <sup>a</sup> |               |              |       |              |       |
| Eigen vectors <sup>b</sup>   |               | PC1          | PC2   | PC1          | PC2   |
| N (Grain)                    |               | 0.979        | 0.201 | 0.991        | 0.133 |
| N (Straw)                    |               | 0.991        | 0.128 | 0.997        | 0.058 |
| P (Grain)                    |               | 0.992        | 0.119 | 0.998        | 0.048 |
| P (Straw)                    |               | 0.994        | 0.104 | 0.999        | 0.033 |
| K (Grain)                    |               | 0.992        | 0.126 | 0.998        | 0.056 |
| K (Straw)                    |               | 0.983        | 0.186 | 0.993        | 0.117 |
| Zn (Grain)                   |               | 0.187        | 0.942 | 0.090        | 0.954 |
| Zn (Straw)                   |               | 0.278        | 0.923 | 0.141        | 0.948 |
| Fe(Grain)                    |               | 0.041        | 0.998 | -0.012       | 0.998 |
| Fe (Straw)                   |               | -0.073       | 0.993 | -0.104       | 0.989 |
| Cu (Grain)                   |               | 0.799        | 0.594 | 0.818        | 0.568 |
| Cu (Straw)                   |               | 0.870        | 0.488 | 0.895        | 0.441 |
| Mn(Grain)                    |               | 0.488        | 0.856 | 0.488        | 0.854 |
| Mn (Straw)                   |               | 0.352        | 0.916 | 0.325        | 0.923 |

**Extraction Method:** Principal Component Analysis;

**Rotation Method:** Varimax with Kaiser Normalization

<sup>a</sup>Bold faced factor loadings are considered highly weighted;

<sup>b</sup>Rotation converged in 5 iterations.