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**Supplementary Material**

# Genotypic variability and physio-morphological efficiency of buckwheat (*Fagopyrum* spp.) under moisture stress at mid-altitudes of Meghalaya (India)

*Subarna Hajong*[A], *Krishnappa Rangappa*[B,*], *Harish Ganjalagatta Dasaiah*[A], *Prabha Moirangthem*[B], *Uday Sankar Saikia*[B], *Bijoya Bhattacharjee*[B], *Sudhir Pal Ahlawat*[C], *and Basant Kumar Kandpal*[B]

[A]ICAR - National Bureau of Plant Genetic Resources Regional Station, Shillong, Umiam 793103, Meghalaya, India.

[B]ICAR Research Complex for North Eastern Hill Region, Umiam 793103, Meghalaya, India.

[C]ICAR - National Bureau of Plant Genetic Resources, PUSA Campus, New Delhi 110012, India.

[*]Correspondence to: Krishnappa Rangappa ICAR Research Complex for North Eastern Hill Region, Umiam 793103, Meghalaya, India Email: krishphysiology@gmail.com

**Supplementary Table S1. Genetic variability of growth and yield attributes of buckwheat accessions used during field experiment**

| Sl No. | Accession No. | Species name | Place of collection | Plant height (cm) | No. of primary branches/ plant | Leaf area ($cm^2$) | Total seed yield (qt/ha) | TSW (g) |
|---|---|---|---|---|---|---|---|---|
| 1 | IC-13145 | *F. himalianum* | HP | 68.00 | 6.67 | 29.32 | 2.18 | 26.77 |
| 2 | IC-13411 | *F. tartaricum* | HP | 77.33 | 6.33 | 60.21 | 13.10 | 17.43 |
| 3 | IC-14889 | *F. tartaricum* | Assam | 30.33 | 6.00 | 34.93 | 3.70 | 19.17 |
| 4 | IC-16557 | *F. tartaricum* | UP | 82.00 | 4.33 | 32.53 | 4.47 | 25.90 |
| 5 | IC-18225 | NA | NA | 78.00 | 4.33 | 43.28 | 5.26 | 29.93 |
| 6 | IC-18132 | NA | NA | 96.67 | 4.00 | 32.16 | 7.11 | 27.77 |
| 7 | IC-18751 | *F. esculentum* | NA | 35.00 | 5.00 | 42.00 | 4.37 | 21.37 |
| 8 | IC-18827 | NA | NA | 75.33 | 4.33 | 30.74 | 2.79 | 32.37 |
| 9 | IC-24298 | *F. tartaricum* | UP | 110.00 | 4.67 | 48.67 | 12.84 | 21.63 |
| 10 | IC-25993 | NA | NA | 34.00 | 3.00 | 28.97 | 4.33 | 29.80 |
| 11 | IC-26590 | *F. tartaricum* | Rajasthan | 55.67 | 3.67 | 24.58 | 2.83 | 31.10 |
| 12 | IC-26599 | NA | NA | 64.33 | 4.00 | 27.48 | 3.70 | 30.33 |
| 13 | IC-26600 | *F. tartaricum* | Maharastra | 49.00 | 4.67 | 54.19 | 6.39 | 29.03 |
| 14 | IC-31265 | NA | NA | 47.33 | 4.67 | 52.92 | 4.33 | 27.83 |
| 15 | IC-37266 | F. esculentum | Sikkim | 81.00 | 3.67 | 40.52 | 7.09 | 32.13 |
| 16 | IC-37267 | *F. esculentum* | Sikkim | 73.67 | 3.33 | 25.21 | 5.22 | 30.80 |
| 17 | IC-37299 | *F. tartaricum* | Sikkim | 71.00 | 6.33 | 25.63 | 3.61 | 24.87 |
| 18 | IC -37303 | *F. tartaricum* | Sikkim | 65.67 | 3.67 | 23.73 | 3.94 | 28.60 |
| 19 | IC-37304 | *F. esculentum* | Sikkim | 73.00 | 3.33 | 27.84 | 4.44 | 29.53 |
| 20 | IC-37305 | *F. esculentum* | Sikkim | 82.33 | 5.67 | 49.08 | 11.41 | 17.10 |
| 21 | IC-37306 | *F. esculentum* | Sikkim | 90.00 | 3.67 | 30.17 | 6.06 | 30.07 |
| 22 | IC-37307 | *F. tartaricum* | Sikkim | 92.67 | 3.00 | 30.38 | 5.37 | 28.43 |
| 23 | IC-37308 | *F. esculentum* | Sikkim | 81.33 | 3.67 | 47.47 | 7.14 | 25.10 |
| 24 | IC-37309 | *F. esculentum* | Sikkim | 83.67 | 3.67 | 25.36 | 3.87 | 27.23 |
| 25 | IC-37311 | *F. esculentum* | Sikkim | 72.33 | 3.00 | 37.97 | 4.41 | 31.23 |
| 26 | IC-38667 | NA | NA | 82.33 | 3.33 | 37.76 | 7.30 | 31.97 |
| 27 | IC-42416 | *F. tartaricum* | UP | 73.67 | 5.33 | 19.20 | 2.74 | 26.47 |
| 28 | IC-42423 | *F. tartaricum* | UP | 64.67 | 6.67 | 32.23 | 4.18 | 24.23 |
| 29 | IC-42426 | *F. tartaricum* | UP | 67.67 | 7.00 | 28.10 | 0.89 | 20.40 |
| 30 | IC-42430 | *F. esculentum* | UP | 82.00 | 4.33 | 28.40 | 4.44 | 33.00 |
| 31 | IC-42433 | *F. esculentum* | UP | 85.67 | 3.33 | 41.73 | 4.44 | 28.67 |
| 32 | IC-79192 | *F. esculentum* | HP | 84.67 | 4.00 | 42.85 | 3.70 | 32.97 |
| 33 | IC-104485 | NA | NA | 82.33 | 3.33 | 32.65 | 6.00 | 26.43 |
| 34 | IC-107096 | NA | HP | 88.00 | 3.33 | 45.62 | 6.00 | 28.43 |
| 35 | IC-107216 | *F. esculentum* | HP | 98.67 | 3.00 | 41.50 | 3.70 | 31.83 |
| 36 | IC-107265 | *F. esculentum* | HP | 88.67 | 3.00 | 43.12 | 4.89 | 28.07 |
| 37 | IC-107285 | *F. esculentum* | HP | 82.83 | 4.00 | 27.51 | 2.72 | 27.13 |
| 38 | IC-107807 | *F. esculentum* | HP | 78.00 | 3.67 | 24.08 | 4.10 | 26.83 |
| 39 | IC-107990 | *F. tartaricum* | HP | 101.00 | 3.33 | 45.05 | 1.77 | 24.07 |
| 40 | IC-107991 | *F. esculentum* | HP | 70.00 | 3.33 | 30.11 | 2.51 | 32.87 |
| 41 | IC-108499 | *F. tartaricum* | HP | 75.67 | 6.33 | 39.30 | 4.42 | 28.20 |
| 42 | IC-108504 | *F. tartaricum* | HP | 58.33 | 6.00 | 25.83 | 4.22 | 28.70 |
| 43 | IC-108511 | *F. esculentum* | HP | 63.67 | 3.33 | 31.73 | 3.70 | 34.67 |
| 44 | IC-108515 | *F. esculentum* | HP | 77.00 | 3.67 | 25.50 | 3.63 | 29.83 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 45 | IC-108517 | *F. esculentum* | HP | 75.33 | 3.00 | 39.82 | 4.39 | 16.33 |
| 46 | IC-109239 | *F. esculentum* | HP | 76.33 | 3.67 | 30.31 | 5.31 | 26.90 |
| 47 | IC-109316 | *F. tartaricum* | HP | 62.67 | 6.33 | 28.04 | 8.40 | 17.20 |
| 48 | IC-109433 | *F. tartaricum* | HP | 74.33 | 6.67 | 17.02 | 2.77 | 24.20 |
| 49 | IC-109468 | *F. himalianum* | HP | 81.00 | 5.67 | 22.40 | 3.74 | 22.30 |
| 50 | IC-105938 | NA | NA | 95.67 | 4.00 | 37.90 | 2.64 | 16.80 |
| 51 | EC-218784 | NA | NA | 60.67 | 3.67 | 23.94 | 0.93 | 23.30 |
| 52 | IC-261963 | *F. esculentum* | UK | 62.33 | 3.33 | 29.37 | 1.89 | 25.77 |
| 53 | IC-266947 | *F. esculentum* | UP | 64.00 | 4.00 | 23.38 | 3.96 | 23.57 |
| 54 | IC-274425 | NA | HP | 69.33 | 6.33 | 22.47 | 2.73 | 23.00 |
| 55 | IC-286379 | NA | NA | 71.67 | 4.00 | 37.61 | 1.89 | 32.17 |
| 56 | IC-310045 | *F. tartaricum* | HP | 70.33 | 5.33 | 41.79 | 2.76 | 30.57 |
| 57 | EC-323723 | NA | NA | 86.00 | 4.00 | 35.06 | 5.89 | 30.20 |
| 58 | EC-323730 | NA | NA | 62.33 | 4.33 | 32.30 | 1.02 | 31.07 |
| 59 | IC-329403 | *F esculentum* | HP | 86.33 | 7.33 | 28.61 | 2.61 | 16.27 |
| 60 | IC-340876 | *F. esculentum* | UK | 68.33 | 5.33 | 34.22 | 4.39 | 25.83 |
| 61 | IC-340881 | *F. esculentum* | UK | 49.67 | 4.33 | 15.76 | 4.44 | 30.70 |
| 62 | IC-340888 | *F. esculentum* | UK | 47.67 | 6.33 | 25.77 | 0.89 | 31.30 |
| 63 | IC-341659 | *F. esculentum* | HP | 89.67 | 6.67 | 39.15 | 8.79 | 19.13 |
| 64 | IC-341660 | *F. esculentum* | HP | 76.33 | 5.00 | 25.53 | 4.38 | 17.47 |
| 65 | IC-360847 | *F. esculentum* | UK | 80.67 | 3.67 | 24.93 | 1.89 | 30.93 |
| 66 | IC-386668 | NA | NA | 86.33 | 4.33 | 56.89 | 3.70 | 29.57 |
| 67 | SHL-RS-133 | NA | NA | 79.33 | 4.00 | 41.44 | 4.44 | 32.13 |

NA - Not available.

**Supplementary Table S2. Initial soil parameters of the experimental site and soil used for the microcosm experiment**

The soil of the experimental site was clay loam in texture. The soil of the experimental field was low in available P (25.4 kg $P_2O_5$ $ha^{-1}$), medium in N (285 kg $ha^{-1}$) and high in K (230 kg $K_20$ kg $ha^{-1}$). The pH and organic carbon content of the soil was 4.85 (1:2.5 soil water) and 2.4%, respectively. The initial soil samples had bulk density of 1.24 Mg $m^{-3}$ and the maximum water holding capacity of 63-65%.

| Parameters | Unit | Soil depth | Content |
|---|---|---|---|
| Bulk density (BD) | Mg $m^{-3}$ | 0-15 cm | 1.24 |
| | | 15-30 cm | 1.34 |
| Soil organic carbon (SOC) | g $kg^{-1}$ | 0-15 cm | 2.40 |
| | | 15-30 cm | 2.04 |
| Total organic carbon (TOC) | g $kg^{-1}$ | 0-15 cm | 2.80 |
| | | 15-30 cm | 2.64 |
| Soil organic carbon (SOC) stock | Mg $ha^{-1}$ | 0-15 cm | 45.36 |
| | | 15-30 cm | 41.00 |
| Soil pH | 1:2.5 | 0-15 cm | 4.85 |
| | | 15-30 cm | 4.50 |
| Available nitrogen (Av.N) | kg $ha^{-1}$ | 0-15 cm | 285 |
| | | 15-30 cm | 198 |
| Available $P_2O_5$ (Av. $P_2O_5$) | kg $ha^{-1}$ | 0-15 cm | 25.4 |
| | | 15-30 cm | 22.5 |
| Available $K_2O$ (Av. $K_2O$) | kg $ha^{-1}$ | 0-15 cm | 230 |
| | | 15-30 cm | 200 |
| Exchangeable Calcium (Ex.Ca) | meq 100 g $soil^{-1}$ | 0-15 cm | 1.80 |
| | | 15-30 cm | 1.65 |
| Exchangeable Magnesium (Ex.Mg) | meq 100 g $soil^{-1}$ | 0-15 cm | 1.60 |
| | | 15-30 cm | 1.40 |
| Available Sulphur (Av.S) | mg $kg^{-1}$ | 0-15 cm | 4.80 |
| | | 15-30 cm | 5.00 |

**Supplementary Table S3. EDAX (Energy x-ray dispersive spectroscopy) data of buckwheat genotype grown with moisture stress and non-water stress conditions under microcosm experiment**

Water stress

| Element | Weight % | Atomic % | Net Int. | Error % |
|---|---|---|---|---|
| C K | 46.2 | 56.09 | 133.6 | 8.14 |
| O K | 42.67 | 38.89 | 127.35 | 10.36 |
| NaK | 0.09 | 0.06 | 0.77 | 76.18 |
| MgK | 2.37 | 1.42 | 36.53 | 8.15 |
| SiK | 0.28 | 0.15 | 6.18 | 18.35 |
| P K | 1.91 | 0.9 | 37.13 | 6.88 |
| ClK | 1.81 | 0.74 | 33.96 | 7.14 |
| K K | 4.66 | 1.74 | 72.57 | 3.78 |

Non water stress

| Element | Weight % | Atomic % | Net Int. | Error % |
|---|---|---|---|---|
| C K | 45.76 | 55.95 | 117.74 | 9.2 |
| O K | 42.5 | 39.01 | 150.47 | 10.26 |
| NaK | 0.31 | 0.2 | 3.1 | 21.87 |
| SiK | 1.96 | 1.02 | 53.23 | 6.02 |
| ClK | 6.81 | 2.82 | 154.94 | 2.43 |
| K K | 2.66 | 1 | 49.06 | 5.19 |