Correction: An Aqueous Extract of *Fagonia cretica* Induces DNA Damage, Cell Cycle Arrest and Apoptosis in Breast Cancer Cells via FOXO3a and p53 Expression

Matt Lam, Kirsten Wolff, Helen Griffiths, Amtul Carmichael

In our article entitled “An Aqueous Extract of *Fagonia cretica* Induces DNA Damage, Cell Cycle Arrest and Apoptosis in Breast Cancer Cells via FOXO3a and p53 Expression” (1), we described the effects of plant material from Pakistan that we referred to as *Fagonia cretica*. Linnaeus in *Species Plantarum* (2) described three species, namely, *cretica*, *arabica* and *hispanica*, while we now have over 160 names published in the genus (3, 4). The circumscription of species in *Fagonia* is reported to be complex due to variability of morphological characters (3, 4).

After the publication of our article it was raised to our attention that in light of the widespread distribution of *F. indica* and the absence from Pakistan of the more narrowly distributed species *F. cretica* the plant material we used in our studies in order to establish if the material originated from *F. indica* or *F. cretica*. These additional analyses have confirmed that the material used in the study originated from *F. indica*.

The methodology for the analyses was as follows: DNA was extracted from batches of plant material using a Qiagen DNAeasy Plant minikit, following manufacturer’s instructions. The chloroplast trnLeu intragenic spacer was amplified using primers trnL-c and trnL-d (6), and the rDNA Internal Transcribed Spacer region was amplified using primers ITS4 and ITS5 (7). Amplification, purification and sequencing were performed as described by Houston and Wolff (8). Sequencing was carried out with the Big Dye Terminator cycle sequencing kit v. 3.1 (Applied Biosystems) according to manufacturer’s instructions. Sequencing products were purified using a Genetix column purification and the sequences of these samples were visualised using an ABI 3100 automated sequencer (Applied Biosystems).

The resulting sequences, both trnL (439 bases) and ITS (489 bases), were blasted to sequences available on GenBank and showed the highest similarity with those of *F. indica* and of *F. paulayana*, while being clearly different from those for *F. cretica* (Table 1). The alignment shows that for trnL the query sample differed from *F. indica* only for the number of repeats in two A-repeats, and one nucleotide substitution with *F. paulayana* (Table 1). The trnL sequence differed from the *F. cretica* sequences for 12 substitutions and 6 insertions/deletions (Table 2). The ITS query sample differed from *F. indica* and *F. paulayana* for 1 and 3 substitutions, respectively, while the difference with *F. cretica* was 36 substitutions and 1 insertion/deletion (Table 3). The alignment of ITS showed ambiguities at certain positions; this is most likely due to a well-known phenomenon of incomplete sequence conversion between the rDNA paralogy, causing intra-individual sequence diversity. Beier et al. (4) describe that *F. indica* and *F. paulayana* occur sympatrically and cannot be distinguished on the basis of sequence data, but that a single morphological character (persistence of sepals) discriminates the two species.

We conclude that *F. indica* or its sister species *F. paulayana* is the genetic identity of the plant material being commonly referred to as *F. cretica* in Pakistan and which has cytotoxic activity towards breast cancer cells. We conclude that it is more likely to be *F. indica* than *F. paulayana* for three reasons. Firstly, our ITS sequence was more similar to that of *F. indica*. Secondly, the trnL sequence only had repeat number differences with *F. indica*, which is a more likely evolutionary step than the substitution that was found in the comparison with *F. paulayana*. Thirdly, the distribution of *F. indica* encompasses the region of origin of our samples. The article title, abstract and main text should therefore refer to *F. indica* and not *F. cretica*. The active compound has now been isolated and is undergoing molecular characterization.

We are grateful to Dr. Schori, an expert plant systematist, who alerted us to the likely misidentification of the species.

Kirsten Wolff was responsible for the additional DNA analyses described in this Correction and she has been added as a co-author. The author list should therefore be revised to read as follows:

Matt Lam, Kirsten Wolff, Helen Griffiths, Amtul Carmichael. Dr. Wolff is affiliated at School of Biology, Newcastle University and has no competing interests in relation to this work.
| Species           | Similarity | Genbank nr   | Species           | Similarity | Genbank nr   |
|-------------------|------------|--------------|-------------------|------------|--------------|
| F. indica         | 99%        | AY641593.1   | F. indica         | 99%        | AY641631.1   |
| F. indica         | 99%        | Y3000769.1   | F. paulayana      | 99%        | AY641652.1   |
| F. indica         | 99%        | AY641592.1   | F. indica         | 99%        | AY641630.1   |
| F. paulayana      | 99%        | AY641607.1   | F. subinermis     | 99%        | AY641642.1   |
| F. paulayana      | 98%        | AY641606.1   | F. paulayana      | 99%        | AY641650.1   |
| F. subinermis     | 98%        | AY641610.1   | F. indica         | 99%        | AY641632.1   |
| F. mahrawa        | 96%        | AY641600.1   | F. paulayana      | 99%        | AY641654.1   |
| F. lahovarii      | 96%        | AY641596.1   | F. mahrawa        | 98%        | AY641639.1   |
| F. hadramautica   | 95%        | AY641590.1   | F. gypsophila     | 98%        | AY641627.1   |
| F. gypsophila     | 95%        | AY641589.1   | F. lahovarii      | 97%        | AY641635.1   |
| F. acerosa         | 95%        | AY641579.1   | F. latistipulata  | 97%        | AY641636.1   |
| F. indica         | 95%        | Y3000770.1   | F. scabra         | 97%        | AY641645.1   |
| F. harpago        | 95%        | AY641591.1   | F. charoides      | 97%        | AY641621.1   |
| F. longisina      | 94%        | AY641599.1   | F. minutistipula  | 96%        | AY641641.1   |
| F. latistipulata  | 94%        | AY641598.1   | F. longisina      | 96%        | AY641637.1   |
| F. brugueri       | 94%        | AY641582.1   | F. glutinosa      | 96%        | AY641626.1   |
| F. minutistipula  | 93%        | AY3000771.1  | F. brugueri       | 96%        | AY641619.1   |
| F. cretica        | 92%        | AJ387942.1   | F. olivieri       | 96%        | AY641646.1   |
| F. densa          | 92%        | AY641587.1   | F. mollis         | 95%        | AY641643.1   |
| F. laevis         | 92%        | AY641594.1   | F. brugueri       | 95%        | AY641620.1   |
| F. villosa        | 92%        | AY641611.1   | F. rangei         | 95%        | AY641647.1   |
| F. mollis         | 92%        | AY641601.1   | F. harpago        | 95%        | AY641629.1   |
| F. laevis         | 92%        | AY641595.1   | F. acerosa        | 95%        | AY641617.1   |
| F. scabra         | 92%        | AY3000768.1  | F. kuntii         | 95%        | AY641638.1   |
| F. charoides      | 91%        | AY641583.1   | F. laevis         | 95%        | AY641634.1   |
| F. orientalis     | 91%        | AY641603.1   | F. laevis         | 95%        | AY641633.1   |
| F. rangei         | 91%        | AY641609.1   | F. palmeri        | 95%        | AY641653.1   |
| F. cretica        | 91%        | AY641585.1   | F. orientalis     | 94%        | AY641648.1   |
| F. arabica        | 91%        | AY641580.1   | F. boveana        | 94%        | KF850598.1   |
| F. scita          | 91%        | AY641586.1   | F. pachycantha    | 94%        | AY641651.1   |
| F. pachycantha    | 90%        | AY641604.1   | F. pachycantha    | 94%        | AY641649.1   |
| F. pachycantha    | 90%        | AY3000772.1  | F. villosa        | 94%        | AY641640.1   |
| F. zilloides      | 90%        | AY641612.1   | F. hadramautica   | 94%        | AY641628.1   |
|                  |            |              | F. arabica        | 93%        | AY641618.1   |
|                  |            |              | F. chilensis      | 93%        | AY641622.1   |
|                  |            |              | F. densa          | 93%        | AY641625.1   |
|                  |            |              | F. cretica        | 93%        | AY641624.1   |
|                  |            |              | F. scoparia       | 90%        | AY641644.1   |
|                  |            |              | F. cretica        | 90%        | AY641623.1   |

doi:10.1371/journal.pone.0040152.t001
Table 2. Aligned sequences of the trn-Leu gene intron for our query sample and a selection of the most similar sequences and most distant sequences within the genus *Fagonia* available at Genbank.

| 10   | 20   | 30   | 40   | 50   | 60   |
|------|------|------|------|------|------|
| trnL intron query | GTGATCAGT | TCAATTCAG | AGAACCCTCG | GAATTAGAAA | TGGGCAATCCC | TGAGCCAAT |
| AJ387943 F.indica | GTGATCAGT | TCAATTCAG | AGAACCCTCG | GAATTATAAA | TGGGCAATCCC | TGAGCCAAT |
| XY41592 F.indica | -------CTT | TCAATTCAG | AGAANCCCTG | GAATTAGAAA | TGGGCAATCCC | TGAGCCAAT |
| XY41608 F.paulayana | GTGATCAGT | TCAATTCAG | AGAACCCTCG | GAATTATAAA | TGGGCAATCCC | TGAGCCAAT |
| XY41600 F.subinermi | GTGATCAGT | TCAATTCAG | AGACCCCTCG | GAATTAGAAA | TGGGCAATCCC | TGAGCCAAT |
| XY41596 F.lahovarii | ------GATCAGT | TCAATTCAG | AGAACCCTCG | GAATTAGAAA | TGGGCAATCCC | TGAGCCAAT |
| AJ387942 F.cretica | GTGATCAGT | TCAATTCAG | AGAACCCTCG | GAATTAGAAA | TGGGCAATCCC | TGAGCCAAT |

| 70   | 80   | 90   | 100  | 110  | 120  |
|------|------|------|------|------|------|
| trnL intron query | CCTGTATCC | TAAAAAAAA | AAAAAGAA | TCAATTA--- | ---TAAATC | AAAAGTAA |
| AJ387943 F.indica | CCTGTATCC | TAAAAAAAA | AAAAAGAA | TCAATTA--- | ---TAAATC | AAAAGTAA |
| XY41592 F.indica | CCTGTATCC | TAAAAAAAA | AAAAAGAA | TCAATTA--- | ---TAAATC | AAAAGTAA |
| XY41608 F.paulayana | CCTGTATCC | TAAAAAAAA | AAAAAGAA | TCAATTA--- | ---TAAATC | AAAAGTAA |
| XY41610 F.subinermi | CCTGTATCC | TAAAAAAAA | AAAAAGAA | TCAATTA--- | ---TAAATC | AAAAGTAA |
| XY41596 F.lahovarii | ------GATCAGT | TCAATTA--- | AAAAAGAA | TCAATTA--- | ---TAAATC | AAAAGTAA |
| AJ387942 F.cretica | CCTGTATCC | TAAAAAAAA | AAAAAGAA | TCAATTA--- | ---TAAATC | AAAAGTAA |

| 130  | 140  | 150  | 160  | 170  | 180  |
|------|------|------|------|------|------|
| trnL intron query | AAAAAAAA | GGTAGTGGC | AGAGACTCAA | TGGAGCTGT | TCTAAAAAAT | GGAGTTGACT |
| AJ387943 F.indica | AAAAAAAA | GGTAGTGGC | AGAGACTCAA | TGGAGCTGT | TCTAAAAAAT | GGAGTTGACT |
| XY41592 F.indica | AAAAAAAA | GGTAGTGGC | AGAGACTCAA | TGGAGCTGT | TCTAAAAAAT | GGAGTTGACT |
| XY41608 F.paulayana | AAAAAAAA | GGTAGTGGC | AGAGACTCAA | TGGAGCTGT | TCTAAAAAAT | GGAGTTGACT |
| XY41610 F.subinermi | AAAAAAAA | GGTAGTGGC | AGAGACTCAA | TGGAGCTGT | TCTAAAAAAT | GGAGTTGACT |
| XY41596 F.lahovarii | AAAAAAAA | GGTAGTGGC | AGAGACTCAA | TGGAGCTGT | TCTAAAAAAT | GGAGTTGACT |
| AJ387942 F.cretica | AAAAAAAA | GGTAGTGGC | AGAGACTCAA | TGGAGCTGT | TCTAAAAAAT | GGAGTTGACT |

| 190  | 200  | 210  | 220  | 230  | 240  |
|------|------|------|------|------|------|
| trnL intron query | ACTGATTAC | GTTAGCAAG | TCAAGGACTG | TTGACATCGA | AACTTTTTC | A-------GG |
| AJ387943 F.indica | ACTGATTAC | GTTAGCAAG | TCAAGGACTG | TTGACATCGA | AACTTTTTC | A-------GG |
| XY41592 F.indica | ACTGATTAC | GTTAGCAAG | TCAAGGACTG | TTGACATCGA | AACTTTTTC | A-------GG |
| XY41608 F.paulayana | ACTGATTAC | GTTAGCAAG | TCAAGGACTG | TTGACATCGA | AACTTTTTC | A-------GG |
| XY41610 F.subinermi | ACTGATTAC | GTTAGCAAG | TCAAGGACTG | TTGACATCGA | AACTTTTTC | A-------GG |
| XY41596 F.lahovarii | ACTGATTAC | GTTAGCAAG | TCAAGGACTG | TTGACATCGA | AACTTTTTC | A-------GG |
| AJ387942 F.cretica | ACTGATTAC | GTTAGCAAG | TCAAGGACTG | TTGACATCGA | AACTTTTTC | A-------GG |

| 250  | 260  | 270  | 280  | 290  | 300  |
|------|------|------|------|------|------|
| trnL intron query | ATACCTTTT | TTTCTATCAA | ACTCTAAAA | TAAAATATAT | AAGACTTT | TAAATATT |
| AJ387943 F.indica | ATACCTTTT | TTTCTATCAA | ACTCTAAAA | TAAAATATAT | AAGACTTT | TAAATATT |
| XY41592 F.indica | ATACCTTTT | TTTCTATCAA | ACTCTAAAA | TAAAATATAT | AAGACTTT | TAAATATT |
| XY41608 F.paulayana | ATACCTTTT | TTTCTATCAA | ACTCTAAAA | TAAAATATAT | AAGACTTT | TAAATATT |
| XY41610 F.subinermi | ATACCTTTT | TTTCTATCAA | ACTCTAAAA | TAAAATATAT | AAGACTTT | TAAATATT |
| XY41596 F.lahovarii | ATACCTTTT | TTTCTATCAA | ACTCTAAAA | TAAAATATAT | AAGACTTT | TAAATATT |
| AJ387942 F.cretica | ATACCTTTT | TTTCTATCAA | ACTCTAAAA | TAAAATATAT | AAGACTTT | TAAATATT |

| 310  | 320  | 330  | 340  | 350  | 360  |
|------|------|------|------|------|------|
| trnL intron query | GGAATTAATT | GGAAGTGGA | GAAAGATCA | AATAGATTT | TACCAATTC | TTTACTCCAA |
| AJ387943 F.indica | GGAATTAATT | GGAAGTGGA | GAAAGATCA | AATAGATTT | TACCAATTC | TTTACTCCAA |
Table 2. Cont.

|     | 310 | 320 | 330 | 340 | 350 | 360 | 370 | 380 | 390 | 400 | 410 | 420 | 430 | 440 | 450 | 460 | 470 | 480 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| AY641592 F.indica | GGAATTAATT | GGAAGTTGAA | GAAAGAATCA | AATATGATTT | TATCAAATCA | TTACTCCAA | GGAATTAATT | GGAAGTTGAA | GAAAGAATCA | AATATGATTT | TATCAAATCA | TTACTCCAA | GGAATTAATT | GGAAGTTGAA | GAAAGAATCA | AATATGATTT | TATCAAATCA | TTACTCCAA |
| AY641608 F.paulayana | GGAATTAATT | GGAAGTTGAA | GAAAGAATCA | AATATGATTT | TATCAAATCA | TTACTCCAA | GGAATTAATT | GGAAGTTGAA | GAAAGAATCA | AATATGATTT | TATCAAATCA | TTACTCCAA | GGAATTAATT | GGAAGTTGAA | GAAAGAATCA | AATATGATTT | TATCAAATCA | TTACTCCAA |
| AY641610 F.subinermi | GGAATTAATT | GGAAGTTGAA | GAAAGAATCA | AATATGATTT | TATCAAATCA | TTACTCCAA | GGAATTAATT | GGAAGTTGAA | GAAAGAATCA | AATATGATTT | TATCAAATCA | TTACTCCAA | GGAATTAATT | GGAAGTTGAA | GAAAGAATCA | AATATGATTT | TATCAAATCA | TTACTCCAA |
| AY641608 F.mahrana | GGAATTAATT | GGAAGTTGAA | GAAAGAATCA | AATATGATTT | TATCAAATCA | TTACTCCAA | GGAATTAATT | GGAAGTTGAA | GAAAGAATCA | AATATGATTT | TATCAAATCA | TTACTCCAA | GGAATTAATT | GGAAGTTGAA | GAAAGAATCA | AATATGATTT | TATCAAATCA | TTACTCCAA |
| AY641596 F.lahovarii | GGAATTAATT | GGAAGTTGAA | GAAAGAATCA | AATATGATTT | TATCAAATCA | TTACTCCAA | GGAATTAATT | GGAAGTTGAA | GAAAGAATCA | AATATGATTT | TATCAAATCA | TTACTCCAA | GGAATTAATT | GGAAGTTGAA | GAAAGAATCA | AATATGATTT | TATCAAATCA | TTACTCCAA |
| AJ387942 F.cretica | GGAATCAATT | GGAAGTTTAA | GAAAGAATCA | AATATGATTT | TATCAAATCA | TTACTCCAA | GGAATCAATT | GGAAGTTTAA | GAAAGAATCA | AATATGATTT | TATCAAATCA | TTACTCCAA | GGAATCAATT | GGAAGTTTAA | GAAAGAATCA | AATATGATTT | TATCAAATCA | TTACTCCAA |

trnL intron query

|     | 430 | 440 | 450 | 460 | 470 | 480 |
|-----|-----|-----|-----|-----|-----|-----|
| AY641592 F.indica | TCTATATGTC | AATATTGACA | ACAATGAAAT | TTATAGTGAG | AGGAAAATCC | GTCGATTTTA |
| AY641608 F.paulayana | TCTATATGTC | AATATTGACA | ACAATGAAAT | TTATAGTGAG | AGGAAAATCC | GTCGATTTTA |
| AY641610 F.subinermi | TCTATATGTC | AATATTGACA | ACAATGAAAT | TTATAGTGAG | AGGAAAATCC | GTCGATTTTA |
| AY641600 F.mahrana | TCTATATGTC | AATATTGACA | ACAATGAAAT | TTATAGTGAG | AGGAAAATCC | GTCGATTTTA |
| AY641596 F.lahovarii | TCTATATGTC | AATATTGACA | ACAATGAAAT | TTATAGTGAG | AGGAAAATCC | GTCGATTTTA |
| AJ387942 F.cretica | TCTATATGTC | AATATTGACA | ACAATGAAAT | TTATAGTGAG | AGGAAAATCC | GTCGATTTTA |

|     | 490 |
|-----|-----|
| AY641592 F.indica | TCAATGTGGA | GGGT |
| AY641608 F.paulayana | TCAATGTGGA | GGGT |
| AY641610 F.subinermi | TCAATGTGGA | GGGT |
| AY641600 F.mahrana | TCAATGTGGA | GGGT |
| AY641596 F.lahovarii | TCAATGTGGA | GGGT |
| AJ387942 F.cretica | TCAATGTGGA | GGGT |

doi:10.1371/journal.pone.0040152.t002
Table 3. Aligned sequences of the rDNA Internal Transcribed Spacer for our query sample and a selection of the most similar sequences and most distant sequences within the genus *Fagonia* available at Genbank.

| query ITS | 10 | 20 | 30 | 40 | 50 | 60 |
|-----------|----|----|----|----|----|----|
| AGAGCATACC | AGAGCATACC | AGAGCATACC | AGAGCATACC | AGAGCATACC | AGAGCATACC | AGAGCATACC |
| CTTCTCGA | CTTCTCGA | CTTCTCNGA | CTTCTCGA | CTTCTCNGA | CTTCTCGA |
| GTGTCGGAG | GTGTCGGAG | GTGTCGGGAG | GTGTCGGGAG | GTGTCGGGAG | GTGTCGGGAG |
| GGAGACTTCC | GGAGACTTCC | GGAGACTTCC | GGAGACTTCC | GGAGACTTCC | GGAGACTTCC |
| TGACATTATA | TGACATTATA | TGACATTATA | TGACATTATA | TGACATTATA | TGACATTATA |
| ACGAACCCCG | ACGAACCCCG | ACGAACCCCG | ACGAACCCCG | ACGAACCCCG | ACGAACCCCG |

| query ITS | 70 | 80 | 90 | 100 | 110 | 120 |
|-----------|----|----|----|----|----|----|
| GCGTGAAAAA | GCGTGAAAAA | GCGTGAAAAA | GCGTGAAAAA | GCGTGAAAAA | GCGTGAAAAA |
| CGCCAAGGAA | CGCCAAGGAA | CGCCAAGGAA | CGCCAAGGAA | CGCCAAGGAA | CGCCAAGGAA |
| AACAAACAAA | AACAAACAAA | AACAAACAAA | AACAAACAAA | AACAAACAAA | AACAAACAAA |
| AAA-GGAGAC | AAA-GGAGAC | AAA-GGAGAC | AAA-GGAGAC | AAA-GGAGAC | AAA-GGAGAC |
| TGCGTTCGCG | TGCGTTCGCG | TGCGTTCGCG | TGCGTTCGCG | TGCGTTCGCG | TGCGTTCGCG |
| TGGCCTCCTT | TGGCCTCCTT | TGGCCTCCTT | TGGCCTCCTT | TGGCCTCCTT | TGGCCTCCTT |

| query ITS | 130 | 140 | 150 | 160 | 170 | 180 |
|-----------|-----|-----|-----|-----|-----|-----|
| TGATTGAAT | TGATTGAAT | TGATTGAAT | TGATTGAAT | TGATTGAAT | TGATTGAAT |
| CAAATGACT | CAAATGACT | CAAATGACT | CAAATGACT | CAAATGACT | CAAATGACT |
| CTCGCCAACG | CTCGCCAACG | CTCGCCAACG | CTCGCCAACG | CTCGCCAACG | CTCGCCAACG |
| GATATCTCGG | GATATCTCGG | GATATCTCGG | GATATCTCGG | GATATCTCGG | GATATCTCGG |
| CTCCTGCATC | CTCCTGCATC | CTCCTGCATC | CTCCTGCATC | CTCCTGCATC | CTCCTGCATC |
| GATGAAGAAC | GATGAAGAAC | GATGAAGAAC | GATGAAGAAC | GATGAAGAAC | GATGAAGAAC |

| query ITS | 190 | 200 | 210 | 220 | 230 | 240 |
|-----------|-----|-----|-----|-----|-----|-----|
| TGCATTGAAT | TGCATTGAAT | TGCATTGAAT | TGCATTGAAT | TGCATTGAAT | TGCATTGAAT |
| CAAATGACT | CAAATGACT | CAAATGACT | CAAATGACT | CAAATGACT | CAAATGACT |
| CTCGCCAACG | CTCGCCAACG | CTCGCCAACG | CTCGCCAACG | CTCGCCAACG | CTCGCCAACG |
| GATATCTCGG | GATATCTCGG | GATATCTCGG | GATATCTCGG | GATATCTCGG | GATATCTCGG |
| CTCCTGCATC | CTCCTGCATC | CTCCTGCATC | CTCCTGCATC | CTCCTGCATC | CTCCTGCATC |
| GATGAAGAAC | GATGAAGAAC | GATGAAGAAC | GATGAAGAAC | GATGAAGAAC | GATGAAGAAC |

PLOS ONE | www.plosone.org 5 July 2014 | Volume 9 | Issue 7 | e102655
| query | ITS         | Ay641631 F.indica | Ay641630 F.indica | Ay641632 F.indica | Ay641652 F.paulayana | Ay641650 F.paulayana | Ay641654 F.paulayana | Ay641642 F.subinermi | Ay641639 F.mahran | Ay641627 F.gypsophil | Ay641635 F.lahovarii | Ay641636 F.latistipu | Ay641641 F.minutisti | Ay641624 F.cretica | Ay641623 F.cretica |
|-------|-------------|-------------------|-------------------|-------------------|----------------------|----------------------|----------------------|-------------------|------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------------|
| 190   | GTGCGAAT    | GCGATCTGG         | GTGGAATGG         | CAGATCCAG         | TGGACGATCG          | TGGACGATCG          | TGGACGATCG          | TGGACGATCG         | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       |
| 200   | GTGCGAAT    | GCGATCTGG         | GTGGAATGG         | CAGATCCAG         | TGGACGATCG          | TGGACGATCG          | TGGACGATCG          | TGGACGATCG         | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       |
| 210   | GTGCGAAT    | GCGATCTGG         | GTGGAATGG         | CAGATCCAG         | TGGACGATCG          | TGGACGATCG          | TGGACGATCG          | TGGACGATCG         | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       |
| 220   | GTGCGAAT    | GCGATCTGG         | GTGGAATGG         | CAGATCCAG         | TGGACGATCG          | TGGACGATCG          | TGGACGATCG          | TGGACGATCG         | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       |
| 230   | GTGCGAAT    | GCGATCTGG         | GTGGAATGG         | CAGATCCAG         | TGGACGATCG          | TGGACGATCG          | TGGACGATCG          | TGGACGATCG         | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       |
| 240   | GTGCGAAT    | GCGATCTGG         | GTGGAATGG         | CAGATCCAG         | TGGACGATCG          | TGGACGATCG          | TGGACGATCG          | TGGACGATCG         | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       |
| 250   | GTGCGAAT    | GCGATCTGG         | GTGGAATGG         | CAGATCCAG         | TGGACGATCG          | TGGACGATCG          | TGGACGATCG          | TGGACGATCG         | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       |
| 260   | GTGCGAAT    | GCGATCTGG         | GTGGAATGG         | CAGATCCAG         | TGGACGATCG          | TGGACGATCG          | TGGACGATCG          | TGGACGATCG         | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       |
| 270   | GTGCGAAT    | GCGATCTGG         | GTGGAATGG         | CAGATCCAG         | TGGACGATCG          | TGGACGATCG          | TGGACGATCG          | TGGACGATCG         | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       |
| 280   | GTGCGAAT    | GCGATCTGG         | GTGGAATGG         | CAGATCCAG         | TGGACGATCG          | TGGACGATCG          | TGGACGATCG          | TGGACGATCG         | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       |
| 290   | GTGCGAAT    | GCGATCTGG         | GTGGAATGG         | CAGATCCAG         | TGGACGATCG          | TGGACGATCG          | TGGACGATCG          | TGGACGATCG         | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       |
| 300   | GTGCGAAT    | GCGATCTGG         | GTGGAATGG         | CAGATCCAG         | TGGACGATCG          | TGGACGATCG          | TGGACGATCG          | TGGACGATCG         | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       |
| 310   | GTGCGAAT    | GCGATCTGG         | GTGGAATGG         | CAGATCCAG         | TGGACGATCG          | TGGACGATCG          | TGGACGATCG          | TGGACGATCG         | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       |
| 320   | GTGCGAAT    | GCGATCTGG         | GTGGAATGG         | CAGATCCAG         | TGGACGATCG          | TGGACGATCG          | TGGACGATCG          | TGGACGATCG         | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       |
| 330   | GTGCGAAT    | GCGATCTGG         | GTGGAATGG         | CAGATCCAG         | TGGACGATCG          | TGGACGATCG          | TGGACGATCG          | TGGACGATCG         | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       |
| 340   | GTGCGAAT    | GCGATCTGG         | GTGGAATGG         | CAGATCCAG         | TGGACGATCG          | TGGACGATCG          | TGGACGATCG          | TGGACGATCG         | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       |
| 350   | GTGCGAAT    | GCGATCTGG         | GTGGAATGG         | CAGATCCAG         | TGGACGATCG          | TGGACGATCG          | TGGACGATCG          | TGGACGATCG         | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       |
| 360   | GTGCGAAT    | GCGATCTGG         | GTGGAATGG         | CAGATCCAG         | TGGACGATCG          | TGGACGATCG          | TGGACGATCG          | TGGACGATCG         | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       | TGGACGATCG       |
|   | 310 | 320 | 330 | 340 | 350 | 360 |
|---|-----|-----|-----|-----|-----|-----|
| AY641623 F.cretica | CGCTCCCCAC | TCACAATAGA | TTTGGTGAGT | GTATGATGGT | CTCCCTGTAG | CTATATTTGC |
| AY641631 F.indica | TTGTGGTGGT | CCTAAACATG | AGTCTCTGGG | CGGAATTGTA | CCACGCTCTT | AGGTTGTCGA |
| AY641630 F.indica | TTGTGGTGGT | CCTAAACATG | AGTCTCTGGG | CGGAATTGTA | CCACGCTCTT | AGGTTGTCGA |
| AY641632 F.indica | TTGTGGTGGT | CCTAAACATG | AGTCTCTGGG | CGGAATTGTA | CCACGCTCTT | AGGTTGTCGA |
| AY641652 F.paulayana | TTGTGGTGGT | CCTAAACATG | AGTCTCTGGG | CGGAATTGTA | CCACGCTCTT | AGGTTGTCGA |
| AY641650 F.paulayana | TTGTGGTGGT | CCTAAACATG | AGTCTCTGGG | CGGAATTGTA | CCACGCTCTT | AGGTTGTCGA |
| AY641654 F.paulayana | TTGTGGTGGT | CCTAAACATG | AGTCTCTGGG | CGGAATTGTA | CCACGCTCTT | AGGTTGTCGA |
| AY641642 F.subinermi | TTGTGGTGGT | CCTAAACATG | AGTCTCTGGG | CGGAATTGTA | CCACGCTCTT | AGGTTGTCGA |
| AY641639 F.mahrana | TTGTGGTGGT | CCTAAACATG | AGTCTCTGGG | CGGAATTGTA | CCACGCTCTT | AGGTTGTCGA |
| AY641627 F.gypsophil | TTGTGGTGGT | CCTAAACATG | AGTCTCTGGG | CGGAATTGTA | CCACGCTCTT | AGGTTGTCGA |
| AY641635 F.lahovarii | TTGTGGTGGT | CCTAAACATG | AGTCTCTGGG | CGGAATTGTA | CCACGCTCTT | AGGTTGTCGA |
| AY641636 F.latistipu | TTGTGGTGGT | CCTAAACATG | AGTCTCTGGG | CGGAATTGTA | CCACGCTCTT | AGGTTGTCGA |
| AY641641 F.minutisti | TTGTGGTGGT | CCTAAACATG | AGTCTCTGGG | CGGAATTGTA | CCACGCTCTT | AGGTTGTCGA |
| AY641624 F.cretica | TTGTGGTGGT | CCTAAACATG | AGTCTCTGGG | CGGAATTGTA | CCACGCTCTT | AGGTTGTCGA |
| AY641623 F.cretica | TTGTGGTGGT | CCTAAACATG | AGTCTCTGGG | CGGAATTGTA | CCACGCTCTT | AGGTTGTCGA |
|   | 370 | 380 | 390 | 400 | 410 | 420 |
| query ITS | AACCCTGAAG | GATCGTGTGC | CCATTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641631 F.indica | AACCCTGAAG | GATCGTGTGC | CCATTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641630 F.indica | AACCCTGAAG | GATCGTGTGC | CCATTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641632 F.indica | AACCCTGAAG | GATCGTGTGC | CCATTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641652 F.paulayana | AACCCTGAAG | GATCGTGTGC | CCATTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641650 F.paulayana | AACCCTGAAG | GATCGTGTGC | CCATTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641654 F.paulayana | AACCCTGAAG | GATCGTGTGC | CCATTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641642 F.subinermi | AACCCTGAAG | GATCGTGTGC | CCATTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641639 F.mahrana | AACCCTGAAG | GATCGTGTGC | CCATTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641627 F.gypsophil | AACCCTGAAG | GATCGTGTGC | CCATTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641635 F.lahovarii | AACCCTGAAG | GATCGTGTGC | CCATTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641636 F.latistipu | AACCCTGAAG | GATCGTGTGC | CCATTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641641 F.minutisti | AACCCTGAAG | GATCGTGTGC | CCATTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641624 F.cretica | AACCCTGAAG | GATCGTGTGC | CCATTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641623 F.cretica | AACCCTGAAG | GATCGTGTGC | CCATTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
|   | 430 | 440 | 450 | 460 | 470 | 480 |
| query ITS | TGTCGATCT | ACCTTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641631 F.indica | TGTCGATCT | ACCTTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641630 F.indica | TGTCGATCT | ACCTTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641632 F.indica | TGTCGATCT | ACCTTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641652 F.paulayana | TGTCGATCT | ACCTTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641650 F.paulayana | TGTCGATCT | ACCTTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641654 F.paulayana | TGTCGATCT | ACCTTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641642 F.subinermi | TGTCGATCT | ACCTTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641639 F.mahrana | TGTCGATCT | ACCTTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641627 F.gypsophil | TGTCGATCT | ACCTTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641635 F.lahovarii | TGTCGATCT | ACCTTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641636 F.latistipu | TGTCGATCT | ACCTTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641641 F.minutisti | TGTCGATCT | ACCTTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641624 F.cretica | TGTCGATCT | ACCTTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |
| AY641623 F.cretica | TGTCGATCT | ACCTTTTA-G | CCATAGAGAG | GAACTTGCAA | CCCTAGAGCA |

Table 3. Cont.
References

1. Lam M, Carmichael AR, Griffiths HR (2012) An Aqueous Extract of Fagonia cretica Induces DNA Damage, Cell Cycle Arrest and Apoptosis in Breast Cancer Cells via FOXO3a and p53 Expression. PLoS ONE 7(6): e40152. doi:10.1371/journal.pone.0040152

2. Muller-Wille S, Reeds K (2007) A translation of Carl Linnaeus’s introduction to Genera plantarum (1737). Studies in history and philosophy of biological and biomedical sciences 38:563-72

3. Beier BA (2005) A revision of the desert shrub Fagonia (Zygophyllaceae). Systematics and Biodiversity 3:221-63

4. Beier BA, Nylander JA, Chase MW, Thulin M (2004) Phylogenetic relationships and biogeography of the desert plant genus Fagonia (Zygophyllaceae), inferred by parsimony and Bayesian model averaging. Molecular phylogenetics and evolution 33:91-108

5. Nasit E, Ali SI. Eds. Flora of West Pakistan http://www.tropicos.org/Name/34660187?projectId=32

6. Taberlet P, Gielly L, Pautou G, Bouvet J (1991) Universal primers for amplification of three non-coding regions of chloroplast DNA. Plant Molecular Biology 17:1105–1109

7. White TJ, Bruns T, Lee S, Taylor J (1990) Amplification and direct sequencing of fungal ribosomal RNA genes for phylogenetics. In: Innis, M., Gelfand, D., Sninsky, J., White, T., (Eds.), PCR Protocols: A Guide to Methods and Applications. Academic Press, San Diego.

8. Houston K, Wolff K (2012) Rhinanthus minor population genetic structure and subspecies: Potential seed sources of a keystone species in grassland restoration projects. Perspectives in Plant Ecology, Evolution and Systematics 14:423–433