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Short Communication

# Combining ability studies on quality characters in cumbu napier hybrids

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Among the cereals, pearlmillet [*Pennisetum glaucum* (L.) R-Br.] is a grain cum fodder crop of the arid, semi arid tracts of India because of its growing habit with thick and succulent stem and its green fodder is very valuable as a cattle feed on account of its high albuminoid and fat contents and it can be fed to cattle without harm at any stage of growth because of absence of HCN [1]. Napier grass [*Pennisetum purpureum* (K.) Schum], an allied species of bajra is a perennial heavy yielder of low quality forage besides being less palatable. But it is otherwise endowed with virtues like tall growing, profusely tillering and high leafiness all of which go to contribute towards high biomass production [2]. The inter-specific hybrids between Bajra and Napier grass are highly vigorous and produces an abundance of quality forage. The hybrid combines the high yielding ability of Napier grass and good quality attributes of bajra and found to exhibit considerable heterosis for both yield and quality [3-5]. For developing better varieties or hybrids through hybridization, the choice of suitable parents is a matter of great concern to the plant breeder. Since the studies on combining ability of parents like bajra and napier grass are meager, the present investigation was undertaken to estimate combining ability of quality characters in interspecific hybrids of *P. glaucum* × *P. purpureum*.

Eighteen fodder pearlmillet genotypes (2n = 14) *viz.*, L 72, PCB 141, PCB 143, APFB 2, APFB 3, Comp 8, Comp 9, HC 4, RGB 1C 9, AFB 4-1, AFB 52-12, NATH 211, ICMV 86104, L 90, LC 19-1, PCB 87-24, Co 8 and NBH 1 as lines and five accessions of napier grass (2n = 28) *viz.*, FD 429, FD 437, FD 439, FD 446 and FD 464 as testers were crossed in line × tester mating design. The 23 parents and 90 $F_1$ hybrids were evaluated at Department of Forage Crops, Tamil Nadu Agricultural University, Coimbatore in a randomized block design with two replications. A single crossed seed was hand dibbled on the sides of 7 m length, spaced 50 cm apart, with 2 cm between plants initially. The selfed female plants were removed, which were identified at the time of flowering. The following quality characters were estimated on five random plants and representative plant samples were collected from each hybrid and parents after harvest when the crop was 5 months old, reaching the third harvest after planting. The dry matter content was determined according to the standard method [6] and was expressed in percentage. The crude protein content was estimated using the method [7] and the total nitrogen was multiplited by factor 6.25 to get crude protein estimate. Ash and fat contents were determined according to the standtard methods respectively [6]. Crude fibre was determined according to the method adopted by [8] and was expressed in percentage. Oxalic acid was determined according to the method adopted by [9]. The combining ability analysis was done according to the standard method [10].

Though combining ability studies bring out information on the nature of gene action for various biometrical traits with a view to formulate breeding methods for crop improvement, the results of the present investigation are not interpreted in terms of gene action, as the parents involved are of two different ploidy levels and the resultant interspecific hybrids are mostly male and/or female sterile.

The combining ability variances (data not presented) indicated the importance of both the lines and testers by way of their respective contributions to the total variance for the characters under study. The variance due to lines was high for crude protein content whereas it was high for the rest of the characters in the testers. The contribution by the interaction component of lines × testers was more than that of lines for ash content, crude fibre and oxalic acid contents and it was more than testers for none of the characters. The *sca* variances were higher than the *gca* variances for all characters. The *sca* variances were high for crude protein content and dry matter content in fodder sorghum [11, 12, 9].

**Table 1.** Best parents on the basis of *per se* performance and general combining ability effects

| Characters | Female parents (*P. glaucum*) | | Male parents (*P. purpureum*) | |
|---|---|---|---|---|
| | *Per se* performance | *gca* effects | *Per se* performance | gca effects |
| Green fodder yield per plant | RCB IC-9 | RCB IC-9 | FD 459 | FD 464 |
| | APFB-3 | PCB-143 | FD 428 | |
| | APFB-1 | APFB-3 | FD 457 | |
| | LC 19-1 | NATH.211 | FD 429 | |
| | PCB 87-24 | CO8 | FD 432 | |
| Crude protein content | NATH.211 | APFB-3 | FD 464 | FD 464 |
| | COMP.9 | L.72 | FD 426 | |
| | LC 19-1 | APFB-2 | FD 437 | |
| | AFB 27-8-10 | LC19-1 | FD 446 | |
| | CO 8 | NBH 7 | FD 428 | |
| | | | FD445 | |
| Crude fat content | RCB IC-9 | ICMV- | FD 464 | FD 464 |
| | COMP.9 | 86104 | FD 448 | FD 429 |
| | L.74 | CO 8 | FD 450 | |
| | AFB 26-12-2 | LC 19-1 | FD 447 | |
| | PCB-141 | PCB 87-24 | FD 435 | |
| | | RCB IC-9 | FD 467 | |
| Low crude fibre content | APFB-1 | CO 8 | FD 466 | FD 429 |
| | CO 8 | | FD 470 | |
| | AFB 27-8-10 | | FD 459 | |
| | L.74 | | FD 431 | |
| | AFB 48-1 | | FD 436 | |
| | | | FD 457 | |
| | | | FD 458 | |
| | | | FD 460 | |
| Low oxalic acid content | COMP.6 | ICMV- | FD 429 | FD 429 |
| | UUJ.2 | 86104 | FD 439 | FD 464 |
| | CO 8 | RGB IC-9 | FD 465 | |
| | PCB-140 | COMP.9 | FD 426 | |
| | PCB-143 | L.72 | FD 451 | |
| | | PCB 87-24 | | |

Considering the *gca* effects for quality characters (Table 1), among the five top ranking *P. glaucum* genotypes (lines) for significant *gca* effects for green fodder yield, only two parents RCB IC-9 (dry matter, crude fat and low oxalic acid contents) and Co 8 (crude fat, low crude fibre and low oxalic acid contents) showed significant *gca* effects for maximum number of quality characters.

In the case of *P. purpureum* genotypes (testers), parent FD 464 recorded significant *gca* effects for five characters *viz.*, dry matter content, ash content, crude protein, crude fat contents and low oxalic acid contents.

The hybrid PCB 141 × FD 429 showed higher *sca* effects for crude protein content, dry matter content and low oxalic acid contents (Table 2). The other hybrid *viz.*, APFB 3 × FD 464 was a better specific combiner for dry matter content, crude fat content and low crude fibre content. Hence these two hybrids are worthy for forwardal to advance yield trials to evolve bajra napier hybrids with better quality characters.

**Table 2.** Best hybrids selected based on *per se* performance and specific combining ability effects

| Characters | *Per se* performance | *sca* effects |
|---|---|---|
| Green fodder yield per plant | RGB IC-9 × FD 464 | RGB IC-9 × FD 464 |
| | ICMV-86104 × FD429 | ICMV-86104 × FD429 |
| | PCB-143 × FD 439 | PCB-143 × FDFD439 |
| | AFB4-1 × FD464 | NATH.211 × FD446 |
| | APFB-2 × FD 464 | AFB4-1 × FD464 |
| | CO 8 × FD 464 | APFB-2 × FD 464 |
| | APFB-3 × FD 464 | HC.4 × FD 439 |
| | AFB52-12 × FD464 | L.90 × FD 437 |
| | HC.4 × FD 464 | NBH-7 × FD 446 |
| | NATH.211 × FD446 | PCB 87-24 × FD 437 |
| Crude protein content | APFB-3 × FD429 | RGB IC-9 × FD 464 |
| | PCB-143 × FD437 | PCB-141 × FD429 |
| | LC19-1 × FD439 | AFB4-1 × FD429 |
| | COMP.9 × FD464 | PCB-143 × FD437 |
| | PCB-141 × FD429 | COMP.9 × FD464 |
| Crude fat content | APFB-3 × FD464 | PCB-143 × FD439 |
| | PCB-87-24 × FD 429 | NBH-7 × FD429 |
| | CO 8 × FD 464 | APFB-2 × FD464 |
| | APFB-2 × FD464 | COMP.8 × FD429 |
| | NBH-7 × FD429 | APFB-3 × FD464 |
| Low crude fibre content | CO 8 × FD 464 | AFB4-1 × FD464 |
| | AFB52-12 × FD429 | HC.4 × FD446 |
| | RCB IC-9 × FD 464 | APFB-3 × FD464 |
| | CO 8 × FD 446 | CO 8 × FD 464 |
| | L.72 × FD429 | |
| Low oxalic acid content | PCB-141 × FD 429 | APFB-3 × FD446 |
| | APFB-3 × FD446 | PCB-143 × FD437 |
| | COMP. × FD429 | PCB-141 × FD429 |
| | APFB-2 × FD437 | NATH.21 × FD439 |
| | HC.4 × FD464 | AFB4-1 × FD437 |
| | .ICMV-86104 × FD437 | |
| | LC 19-1 × FD464 | |

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