

RESULTS AND DISCUSSION

In hemispherical shaped foot valves the 'K' varies from 1.66 to 5.24 for discharge variation of 0.017 to 0.009 m³/sec, whereas it varies from 0.94 to 2.36 for discharge variation of 0.18 to 0.009 m³/sec. in the case of cylindrical shaped foot valves (Table 1). From the result it is clearly seen that that coefficient of resistance (K) is more in hemispherical shaped foot valves and less in cylindrical shaped foot valves for normal discharge rate. Among hemispherical foot valves the strainer opening ratio and discharge are inversely proportional to the coefficient of resistance. From the table it is imperative that within the cylindrical shape foot valves, the strainer opening Ratio and Discharge are inversely proportional to the resistance coefficient.

The head loss and corresponding coefficient of resistance varies with the entry velocity into the foot valve dome, smoothness of the material and shape of the valve and the strainer opening. Their values have been arrived at from experiments and reported by several agencies.

It was earlier observed that the coefficient of resistance for foot valve could be 0.8 for all sizes of suction pipes. Patel and Gupta (1979)

reported the test results of 10 makes of foot valves in connection with a petroleum conservation study and the values of coefficient of resistance ranged from 2.25 to 13.9. The Soil and Water Engineering Department, Punjab observed that the value of resistance coefficient for commercially available as 1.91 to 5.88. Seva Ram *et al.*, (1982) evaluated the value of the coefficient of friction of hemispherical foot valves, ranged from 11.4 to 2.9. Patel (1982) observed the values of coefficient of Resistance ranging from 2.3 to 14.0 in Gujarat State. So, Cylindrical shape foot valves are preferred for energy conservation.

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CUMBU-NAPIER HYBRID GRASS CO -3: A NEW HIGH YIELDING FODDER FOR IRRIGATED AREAS

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ABSTRACT

The presently available Cumbu-Napier hybrid grass varieties Co-1 and Co-2 are more suitable for black soil areas and cattle feeding. The new variety Co-3 was developed for red loamy soil areas and is highly suitable for sheept and goats in addition to cattle feeding. It is highly leafy, with long, broad, and softer leaves. In addition, the leaf-stem ratio is higher. It had recorded on an average, 393.6 t/ha/year of green fodder in the Station trials and a maximum yield of 514 t/ha under ART at Pudupalayam in Salem District. The dry matter yield was 65.12 t/ha/year and crude protein yield was 5.40 t/ha/year. The oxalic acid content is also less compared to Co-2

KEY WORDS : Cumbu-Napier Fodder

Among irrigated fodder grasses, Cumbu-Napier hybrids rank first in green fodder yield. At present, two varieties Co-1 and Co-2 are

available for general cultivation (Sivasamy *et al.*, 1994) in Tamil Nadu. However, these two varieties have certain drawbacks like, thick stems and

Characters	CN-2	Co-2
Culm colour	Green	Green
Node colour	Green	Green
Leaf sheath colour	Green	Green
Mid-rib colour	White	White
Leaf margin	serrated	serrated
Length of serrations (0-3 grade)	2	3
No. of serrations per cm	17-19	17-22
Earhead	Greenish yellow	Greenish yellow
Bristles	Prominent 20-25 mm	Prominent 30 mm
Plant height at flowering	300-360 cm	250-300 cm
Tillers per clump	30-40	20-30
4th leaf length	80-95 cm	80-90 cm
4th leaf width	3.0-4.2 cm	2.0-3.0 cm
Stem thickness	1.56 cm	2.45 cm
No. of leaves per clump	450	310
Earhead length	25-30 cm	25-30 cm
Leaf stem ratio	0.70	0.55
Palatability	100.00	95.00

rough leaves, which reduce their palatability. In addition, the anti-nutrient oxalic acid content is also comparatively higher. Moreover, these two varieties are suitable more for black cotton soil areas and their performance in red loamy soils was low. Because of the thick stems and rough leaves in Co-1 and Co-2, these two varieties were more suitable to cattle and there was an urgent need for a more leafy variety for sheep and goats whose population in Tamil Nadu is increasing rapidly than that of the cattle. Taking into consideration all the above factors, breeding efforts were initiated to evolve a suitable variety of Cumbu-Napier grass for the new situations listed above.

Table 1. Green fodder yield of culture CN-2 in different trials

Name of Trial/Year	No. of trials or locations	Average GFY in t/ha/year			% Over best check
		CN-2	Co-1	Co-2	
Station Trials 1982-92	10	393.60	318.50	326.20	20.70
Multilocation Trials 1988-90	9	322.84	286.18	275.86	12.81
All India Co-ordinated Trials 1988-93	12	242.20	208.60	193.60	16.11
Adaptive Research Trials 1993-95	32	273.68	253.77	241.43	13.36
Overall Mean		308.08	266.76	259.27	15.48

MATERIALS AND METHODS

At the Department of Forage Crops of Tamil Nadu Agricultural University, a large germplasm of Napier grass has been assembled. These accessions were crossed as male parent with a number of *cumbu* genotypes which possessed desirable fodder attributes like long, broad leaves, high tillering, low oxalate content etc. The crosses were affected during *kharif* 1980 and the resultant hybrids were evaluated for their fodder yield potential in row trials during 1982 and in preliminary yield trials during 1982 to 1984. The comparative yield trials were conducted thereafter for a number of years. As a result of these evaluations, one variety CN-2 which was a hybrid of Cumbu PT 1697 x *Pennisetum purpureum* was identified as superior with very heavy tillering, possessing long, broad leaves, high leaf stem ratio, photosensitive nature and low oxalate content. Cumbu PT 1697 was also a photosensitive type like the napier male parent.

The culture CN-2 was further tested under multi-location trials (MLT) at different research stations (RS) of the State during 1988-89 and 1989-90 at nine locations. It was also tested under the All India Co-ordinated improvement programme at 12 different locations in the country during 1988-89 to 1992-93. In addition, Adaptive Research Trials (ART) in farmers holdings were also conducted in collaboration with the State Department of Agriculture at 40 locations throughout Tamil Nadu and results were obtained from 32 locations. Laboratory studies were also done to evaluate the fodder quality parameters. The results obtained in the different trials are given below.

Table 2. Green fodder yield in t/ha/year in selected Adaptive Research Trials in Tamil Nadu

Location	CN-2	Co-1	Co-2
Salem	477.50	245.79	249.00
Anthiur	272.00	236.00	264.00
Bhavani	368.00	238.00	266.00
Kodumudi	400.00	373.80	336.00
Dindugal	368.00	332.00	360.00
Tirunelveli	271.73	223.33	248.64
Coimbatore	487.75	410.25	304.75
Pudupalayam	514.00	348.61	301.30

RESULTS AND DISCUSSION

In the RS trials conducted at Coimbatore from 1982 to 1992, the culture CN-2 recorded an average green fodder yield of 393.6 t/ha/year as against 326.2 t/ha/year by Co-2, the yield advantage being 20.7 per cent (Table 1). Similarly in the MLT conducted at nine different locations at different Research Stations of TNAU during 1988-89 and 1989-90, the culture CN-2 recorded on an average 322.84 t/ha/year of green fodder which was 12.81 per cent higher than the best check Co-1 (286.18 t/ha/y). The culture CN-2 also recorded an average yield of 242.2 t/ha/year when it was tested over 12 different locations in the country under All India Co-ordinated trial during 1988-89 to 1992-93. The yield superiority over the national check NB-21 was 25.10 per cent and over Co-1 another check variety was 16.11 per cent. In the ART conducted over 40 locations in Tamil Nadu in collaboration with the State Department of Agriculture, results were obtained from 32 locations and in these trials also, the culture CN-2 recorded an average green fodder yield of 273.68 t/ha/year as against 241.43 t/ha/year by Co-2. The high green fodder yield potential of the culture CN-2 can be seen from the very high yields of upto 514 t/ha/year recorded at different locations of the State in the ART (Table 2). In all the trials combined together, CN-2 recorded an average yield of 308.08 t/ha/year which

Table 3. Fodder quality analysis of CN Hybrids

Analysis	CN-2	Co-1	Co-2
Dry matter content (%)	17.08	16.38	15.00
Crude protein (%)	8.30	8.30	9.06
Ether extractives (%)	1.52	2.29	1.90
Crude fibre (%)	32.38	32.04	33.90
Total ash (%)	14.86	15.43	15.62
Oxalic acid (%)	2.51	2.88	2.83
Dry matter yield t/ha/year	65.12	38.20	50.30
Crude protein yield t/ha/yr	5.40	3.17	4.88
Silica content (%)	5.20	5.37	5.15

was 15.48 per cent higher than that of the best check Co-1 (266.76 t/ha/y)

The results of laboratory analysis of fodder quality parameters of the culture in comparison with Co-1 and Co-2 are given in Table -3. The culture CN-2 recorded a higher dry matter content (17.08%) as well as dry matter yield. The crude fibre content was low at 32.38 per cent. Though the crude protein content was slightly lower at 8.30 per cent similar to that of Co-1, the crude protein yield was comparatively high at 5.40 t/ha/year. The leaf-stem ratio of CN-2 when cut at 45 days interval was 0.70 as compared to 0.55 in Co-2. The culture CN-2 was found to produce a very low stem portion when cut at 45 days interval and this results in 100 per-cent palatability of the grass. The stem portion at 45 days is also very soft and juicy.

Based on the superior performance of CN-2, it was released as an improved strain Co-3 during January '96 by the State Variety Release Committee of Tamil Nadu for general cultivation in the State.

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