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Quality of fodder cowpea varieties as influenced by soil moisture stress levels

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Introduction

A serious drawback of sustainable livestock production system in Kerala is the inadequate seasonal distribution of fodder production. The quantity and quality of herbage available in the lean dry months from January to May is very low. Therefore it is imperative to develop a fodder production system that increases the availability and improves the quality of herbage in the dry summer months. Fodder cowpea (*Vigna unguiculata* L. Walp) is a legume inherently more tolerant to drought than other fodder legumes (Fatokun *et al*., 2009) and considered as a crop capable of improving sustainability of livestock production through its contribution in improving seasonal fodder productivity and nutritive value. The dairy homesteads of Kerala are mostly experiencing light stress of varying intensities. *V. unguiculata* grows well in shade andis useful as a component crop of silvipastoral systems. Evaporative demand is greatly reduced in the shaded environment and soil water availability for the pasture will be maintained at a higher level than in open through the combined effect of less evaporation from soil and lower transpiration rates of the pasture. *V. unguiculata* grows well in shade and is useful as a component crop of silvipastoral systems (Bazil, 2011). It has shade tolerance, quick growth and rapid ground covering ability. Summer cowpea irrigated according to a schedule based on IW/CPE ratio of 0.8 recorded the maximum dry matter production (Subramaniam *et al*., 1993). Fodder cowpea varieties CO-5, COFC- 8, UPC - 618, UPC-622, Bundel Lobia-1 are high yielding and suitable for cultivation in Kerala (Gayathri, 2010). It is the most widely cultivated fodder legume in areas where rainfall is scanty and soils are relatively infertile. Most households that keep livestock raise fodder cowpea as an intercrop with other crops and fodder cowpea forms an integral component of crop livestock farming system (Singh and Tarawali, 2011). Keeping this in view, the present study was taken up with the objective of identifying the quality of fodder cowpea varieties suitable for the dry summer months.

Materials and Methods

A field experiment was conducted in the upland area of the Instructional Farm of College of Agriculture, Vellayani, Trivandrum during the summer season of 2012. The investigation was conducted as two separate experiments, one in open and another in shaded situation (25-35 per cent shade). The design was laid out in split plot with four replications. The main plot factor included four soil moisture stress levels, M1: presowing irrigation + life saving irrigation; M2 :presowing irrigation + irrigation at IW/CPE ratio 0.4; M3 : presowing irrigation + irrigation at IW/CPE ratio 0.6; M4 : presowing irrigation + irrigation at IW/CPE ratio 0.8. The sub plot factor included five fodder cowpea varieties, V1-UPC-618, V2-UPC-622, V3-Bundel Lobia-1, V4-COFC-8 and V5-CO-5. Presowing irrigation was given to all the plots uniformly upto 10 days after sowing for germination and establishment. Thereafter irrigation was given as per the treatments based on the evaporation data and depth of irrigation. . The quantity of water applied to each plot in one irrigation was 600 litres. FYM @ 10 t ha^{-1} was applied uniformly to all the plots at the time of final preparation of land. Entire dose of phosphorus was given as basal @ 30 kg ha^{-1}. Nitrogen @ 40 kg ha^{-1} and potassium @ 30 kg ha^{-1} were given in two equal splits, one as basal and one after one month of sowing. The fodder cowpea varieties as per treatments were sown at a spacing of 30 x 15cm @ 2 seeds $hole^{-1}$ on 14th January 2012 both in open as well as in shade (25-35 per cent). Observations on crude protein content, crude fibre content and crude protein yield were noted.

Results and Discussion

The results revealed that soil moisture stress didn't affect the crude protein content of fodder cowpea in open. COFC-8 (V_4) registered significantly higher crude protein content of 18.76 per cent, followed by Bundel Lobia-1 (V_3) (18.13 per cent). A specific crude protein concentration is the result of N uptake and the development of biomass production which is greatly determined by water availability (Kuchenmeister, 2013). This is in conformity with the findings of Shekara *et al*. (2012) in fodder cowpea genotypes. The interaction effect of soil moisture stress and varieties was not significant. Under 25-35 per cent shade, soil moisture stress levels, varieties and their interaction had significant effect on crude protein content of fodder cowpea. Significantly higher crude protein content (19.13 per cent) was recorded by irrigation at IW/CPE ratio of 0.8 (M_4) which was on par with irrigation at IW/CPE ratio of 0.6 (M_3) (19.07 per cent). Among the

varieties, COFC-8(V_4) recorded significantly higher crude protein content (20.81 per cent) followed by Bundel Lobia-1 (V_3) (18.95). Variety COFC-8 recorded significantly higher crude protein content of 20.84 per cent at soil moisture deficit level of IW/CPE ratio of 0.8 (m_4v_4) which was on par with m_1v_4 (20.78 %), m_2v_4 (20.81 %) and m_3v_4 (20.82 %). The results revealed that soil moisture stress didn't influence the crude fibre content while varieties had significant effect in open condition. Significantly lower crude fibre content was recorded by UPC-622 (V_2) (24.18 per cent). This might be attributed to the reduced lignification of the fibre under water stress condition by this variety. Similar variation for crude fibre content was reported by Radhika (2003) in 50 accessions of fodder cowpea. Under 25-35 per cent shade, the treatments and their interaction failed to exert significant effect on the crude fibre content of fodder cowpea.

Irrigation at IW/CPE ratio of 0.8 (M_4) recorded significantly higher crude protein yield (0.85 t ha^{-1}), followed by irrigation at IW/CPE ratio 0.6 (M_3) (0.73 t ha^{-1}). Among the varieties, COFC-8 (V_4) recorded significantly higher crude protein yield (0.79 t ha^{-1}). The interaction was found to be non significant. Crude protein yield recorded in shaded condition with respect to the soil moisture stress levels varied significantly with M_4 (irrigation at IW/CPE ratio of 0.8) recording the highest crude protein yield (0.42 t ha^{-1}) which was on par with that of M_3 (0.40 t ha^{-1}). Among the varieties, COFC-8 (V_4) recorded significantly higher crude protein yield of 0.41 t ha^{-1}. Among the treatment combinations, COFC-8 irrigated at IW/CPE of 0.8 recorded significantly higher crude protein yield of 0.54 t ha^{-1} which was on par with COFC-8 irrigated at IW/CPE ratio of 0.6 (0.52 t ha^{-1}).

Conclusion

Irrigation improved the quality of fodder in partial shade. Crude protein content of the plant enhanced with increase in irrigation levels. Among the varieties protein content was significantly higher in COFC-8 in open and shade. COFC-8 at all levels of irrigation (m_4v_4, m_3v_4, m_2v_4 and m_1v_4) recorded significantly higher crude protein content.

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