Abstract

Sterculia setigera is an multi-purpose savanna tree which spreads naturally in central and southern Sudan. The species is the main source of the internationally accepted, gum karaya in sudan. The economic importance of the species justifies its identification as a candidate for urgent domestication. This study aimed to provide some of the data on which to base successful domestication of Sterculia setigera and to characterize the gum obtained from the species. To investigate seed characteristics and germination behavior, seeds of Sterculia setigera were collected from El Nour forest, East Eldamazin City in the Blue Nile State, during November-December 2003.Two methods were used for seed collection, namely, crown collection and ground collection. Seed parameters investigated included moisture content, , purity and viability percentages; seed weight number of seeds per kilogram and seed width. The seeds were chemically analyzed. The germination capacity of Sterculia setigera seeds was assessed by the standard germination test. Seeds of Sterculia setigera, from both sources, were subjected to six treatments to study the effect of pregermination treatment to break seed dormancy. The treatments applied were: soaking in tap water for 24, 48 and 72 hours, soaking in boiling water for 5 and 10 minutes, manual removal of aril and untreated seeds (control). Results of the study showed no significant variation in moisture content, soundness and viability percentages between the two methods of collection. Significant variations were found in seed width, size and shape index, seed weight and number of seeds per kilogram. Seeds of Sterculia setigera contain 25.65% fibre, 3.45% ash, 11.12% carbohydrates, 24.10% protein and 25.25% crude oil. The standard germination capacity of Sterculia setigera was low, being 36% for crown collection and 30% for ground collection which is indicative of presence of seed dormancy. The effect of method of collection was found to be insignificant on germination percentage and germination rate. Significant variations were observed among different pregermination treatments. To study the effect of environmental factors on juvenile growth of Sterculia setigera seedlings in the nursery two experiments were conducted. Experiment one investigated the effect of three soil media namely, silt soil, silt/sand mixture 1:1 by volume and sand soil and two light intensities being 100% (full sunlight) and 50 % (partial shade) and their interactions on shoot juvenile growth including shoot height, shoot fresh, shoot dry weight and root collar diameter, and root development including root length, root fresh and root dry weight).The second experiment aimed to investigate the effect of irrigation frequencies (every 3 days , 6 days and 12 days,) on shoot and root growth of Sterculia setigera under controlled conditions. Results of the study revealed significant effect of soil media on shoot and root growth characteristics. Significant variations were observed in mean shoot traits among the different soil media. Seedlings raised in silt soil produced better shoot characteristics compared to seedlings grown in silt/sand mixture or sand. Results showed significant variations between the light intensity treatments for most shoot growth characteristics. Seedlings raised under partial shade (50% light intensity) gave taller soot height and more fresh weight. The effect of irrigation frequency on shoot and root growth characteristics was found to be significant. The results indicated that the best growth performance was obtained when seedlings were irrigated every 3 days. Survival percentage was significantly influenced by irrigation frequency. At age of 16 weeks the percentage in mortality

was highest (57.8%) when the irrigation interval was increased to 12 days To explore the possibility of propagating Sterculia setigera by cuttings, the effect of hormone concentration (0, 2000, 4000, 6000, and 8000 ppm) and season was examined. Cutting were obtained from old mother trees at Elnour Forest East Eldamazin and from 2-3 years old mother plants grown at Soba Nursery. The parameters measured included percentage of rootng, root length and number of roots per rooted cutting. The effect of season was observed to be significant on rootability of cuttings obtained from both old and young mother plants. Cuttings obtained from old mother plants failed to root during Summer and Atumun. Cuttings of young mother plants rooted succesfully during the three seasons and the highest rooting percentage (36.8%) was obtained during winter. Variations among different IBA concentrations were significant.The performance of rooting of cuttings was best with 6000 and 4000 ppm concentrations for old and young moter plants, respectivel. To characterize Sterculia setigera gum (gum karaya), gum samples were collected from El Nour forest, East Eldamazin City in the Blue Nile State, and from Rashad area (Gabal Alahmer and Um-Abdalla forest) in South Kordofan State during April, May and June 2004. The physiochemical properties of gum were studied to determine moisture content percentage, pH value, ash content percentage, specific optical rotation, intrinsic viscosity, equivalent weight and uronic acid percentage. Cationic composition was also determined. Results of the study revealed insignificant variations in physiochemical properties, except for intrinsic viscosity, of Blue Nile and Kordofan karaya gums. Mineral composition results for gum samples collected from Blue Nile State showed calcium to be the highest followed, in descending order, by magnesium, potassium, sodium, iron, manganese, cobalt, zinc and copper, whereas cationic concentration of gum samples from Kordofan State was in decreasing order; calcium, potassium, magnesium, sodium, iron, cobalt, manganese, zinc and copper. Karaya gum samples collected from both Kordofan region and Blue Nile area gave identical FTIR. spectra indicating that their detailed molecular structures are similar. The study suggests that much attention is to be focused on this important promising species and more research studies to be carried out the silviculture, management and protection of the species to enhance gum karaya production in Sudan.