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Direct seeding of *Sesbania sesban* for green manure in agroforestry systems – a short communication

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Abstract

This study was based at the Agroforestry Research Centre, Maseno Kenya. The objective was to evaluate the effects of pre-treatment, seed rate and depth of sowing seed on direct seeding of *Sesbania sesban*. Direct seeding was shown to be feasible during the rainy season, provided a shallow seed bed was used. Direct seeding at 3 cm furrow depth led to significantly (P = 0.05) greater germination compared to 10 cm depth. There was no effect of pretreatment and seed rate on germination, early seedling growth and dry matter partitioning. Depth of sowing similarly had no effect on early growth and dry matter partitioning. Establishment by direct seeding is relatively non-labour intensive with a probable high adoption potential.

Introduction

Sesbania sesban popularly called sesbania, is a fast growing nitrogen-fixing woody species that is very popular in agroforestry systems in Kenya and other parts of Africa. The provision of cheap, non-laborious field establishment techniques for *S. sesban* is of importance to its utilization for soil fertility improvement in hedge-row inter-cropping, improved fallows or biomass transfer. In these agroforestry systems, large numbers of trees per unit area of land are needed. This inherently high requirement of trees makes the use of nursery raised seedlings too expensive on the one hand while transportation cost of seedlings can also be quite high on the other. To address this problem, the use of bare rooted seedlings has been suggested (Niang et al., 1996). This measure has proved unsatisfactory in that low take-off of bare-root seedlings have led to uneven stand establishment. The possibility to directly seed a stand remains an attractive proposition, provided that sufficiently large amounts of low cost seeds are available and are compatible with indigenous technical knowledge. Optimal germination of seeds in nursery operations with sesbania has been obtained with pre-treatment by soaking in water overnight (Wonyandu, 1990).

As a pre-requisite to direct seeding establishment, it is instructive to define the agronomic conditions influencing this practice amongst which the most important factors include pre-treatment, depth of sowing and the use of seed spreaders to reduce amount of seed required. While the use of sand as a seed spreader is part of indigenous technical knowledge in direct seeding of small grain cereals such as Sorghum (*Sorghum bicolor*) or Finger millet *Eleusine* spp among farmers in Western Kenya, it is not yet known what proportions of sand to seed are required to give an optimal stand density nor has there been any attempt to define this ratio.

The objectives of this study were therefore to determine the effect of pretreatment, seed rate and depth of sowing *S. sesban* directly in the field. These factors were evaluated on germi-

nation, early seedling growth and dry matter partitioning.

Materials and methods

Seeds collected on farms around Maseno were used to establish the trial in single row plots of length 1 m during the rainy seasons in 1994 at the National Agroforestry Research Centre, Maseno, Kenya situated at 0° N 12° S, 34°25′ W–34°47′ E. The annual precipitation was 1625 mm, with daily mean temperatures 23 °C which are typical for this site (Muok et al., 1998). Sand pebbles of similar size (visual evaluation) as sesbania seeds were used to spread out the seed. Part of the seeds were pretreated following the procedure of (Wonyandu 1990). Pretreated and untreated seeds were subdivided and then mixed with sand to give three seed rates (S1, S2 and S3) of 48 seeds m^{-1}, 32 seeds m^{-1} and 24 seeds m^{-1} and sown at depths d1; 3 cm, d2; 10 cm.

The experiment was evaluated for germination, early seedling growth and dry matter partitioning, below and above ground. The data was subjected to analysis of variance and means separation performed according Duncan's Multiple Range Test (DMRT) as needed.

Results and discussion

The results are given (Table 1). There were non-significant effects of pre-treatment and seed rate on germination, early seedling growth and dry matter partitioning. Shallow depth of sowing on the other hand significantly (P = 0.01) enhanced germination irrespective of pre-treatment or seed rate but showed no effect on subsequent early seedling growth and dry matter partitioning (Table 1).

The results obtained in this trial indicate that in establishing *S sesban* in the field by direct seeding, pre-treatment may be of no importance and indeed it is possible that germination in a non-sterilized soil in the field may explain the absence of the seed pre-treatment need recommended in (Wonyandu, 1990).

Mixing seeds with sand pebbles can reduce seed needs by as much as 50%. Since (Niang et al., 1996). have demonstrated high density *S sesban* stands for biomass transfer, there are clearly merits in promoting agronomic practices among farmers that lead to seed saving.

Furrow depth was observed to be the most important factor influencing success with direct seeding of sesbania, mainly because there was substantial reduction in germination by increasing depth from 3 cm to 10 cm. This effect, probably arose from the small seed size of sesbania being

Table 1. The effect of pre-treatment, seed rate and depth of sowing on germination, early seedling growth and dry matter partitioning in *S. sesban*, Maseno, Kenya, 1994

		% germination		Height cm		Dry matter yield (kg m^{-1})[a]	
		Season 1	Season 2	Season 1	Season 2	Above ground	Below ground
Pre-treatment	– P1-untreated	70.8a	74.9a	67.0b	54.9a	40.8	29.1
	– P2 Pre-treated	69.7a	66.7a	76.4a	51.7a	53.3	21.2
Seed rates	– S1–48 Seeds m^{-1}	70.3a	70.0a	74.7a	58.8a	66.9	24.2
	– S2–32 Seeds m^{-1}	74.2a	71.7a	65.6b	52.0a	62.9	27.7
	– S3–24 Seeds m^{-1}	66.3a	69.9a	74.9	52.3a	42.9	27.0
Furrow depth	– D1–3 cm	86.4a	86.6b	71.8a	53.8a	47.0	21.8
	– D2–10 cm	53.8c	54.4c	71.6a	52.9a	58.1	28.2
Mean,		70.2	70.5	71.1	53.3	53.1	25.6
(P = 0.05 & 0.01)		**	**	*	ns	ns	ns
SED		3.69	4.20	3.4	2.9	4.4	3.3
CV%		22.1	5.9	4.8	15.4	23.6	38.6

[a] Dry matter yield in kg per m row length.

incapable of storing sufficient food reserves to support germination from such depth (Data and Bachi, 1991). Conversely the absence of any effect of seed rate on dry matter partitioning was most likely accounted for by thinning the experiment to a uniform stand within two weeks when germination was considered completed.

It can be concluded that germination of *S. sesban* by direct seeding is feasible, provided this is done during the rainy season in a shallow bed Dilution of seeds with sand as done in this experiment is part of indigenous technical knowledge in Africa and is likely to favour the adoption of this practice among farmers. There is hardly any significant benefit to be achieved from pre-treatment of seed for direct seeding so that this extra labour burden can be removed from the farmer without loss in performance.

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