WWW.INDUSTRY.NSW.GOV.AU

primefacts

FOR PROFITABLE, ADAPTIVE AND SUSTAINABLE PRIMARY INDUSTRIES

JUNE 2010 PRIMEFACT 1022

Tropical perennial grasses – sowing rates

GM Lodge

Principal Research Scientist, Industry & Investment NSW, Tamworth

'Seed' of most tropical perennial grasses is sold and sown 'in the floret' or as coated seed. In both cases, 'seed' may also consist of chaffy or inert plant material, empty florets and seeds of other species including weeds. Assess seed quality by obtaining a copy of a current certificate of seed analysis.

Calculation of sowing rate for tropical perennial grasses needs to take into account differences in seed size, seed purity and seed germination.

Aim to establish a *minimum* of 10 plants/m^2 (100,000 plants/ha). This means sowing 170 germinable seeds per m^2 (1.7 million seeds/ha), because seed and seedling losses can be high.

To achieve this plant density, cultivars with large seed size and so lower seed numbers per kg need to be sown at higher rates. Cultivars with low seed purity (often indicating high amounts of empty florets) and/or low germination have low values of pure live seed (PLS) and need to be sown at higher rates to compensate for the low seed quality. Often, these higher sowing rates are not economical and alternative seed sources should be sought.

Seed is sold and sown on a weight basis. Aim to buy seed with high purity and germination and low amounts of inert material and other seeds.

Seed coatings greatly add to seed weight and sowing rate will need to be increased. This should be taken into account when calculating comparative seed costs.

It is essential to establish tropical perennial grass stands with a good plant density so that there are sufficient plants to provide a productive pasture with high ground cover. To achieve this there are three major factors that need close attention:

1. pre-sowing weed control
2. seed quality
3. sowing time and depth.

Finally, you need to ensure that there are sufficient viable seeds sown and this depends on the sowing rate. Don't be tempted to save on sowing costs by reducing sowing rates. If seeding rates are too low, moderate savings made on seed cost at establishment will incur large losses in the early years after establishment, since low density stands have low production, low ground cover and are prone to weed invasion.

Most tropical perennial grass seed is sown either 'in the floret' or as coated seed. Often seed 'in the floret' is as it was harvested and has not been processed to remove the fluffy or awned structures that surround the seed. It has also not been processed to remove other chaffy inert material and seeds of other species (including weeds). Also because of uneven ripening not all florets contain a seed. Similarly, coated seed is often not processed and so all material (stem and leaf material, other seeds and empty florets) is coated.

Seed coating is undertaken commercially to assist the flowability of light or fluffy seeds in seeding equipment. Coating is generally at the rate of 2:1 (i.e. 2 parts seed-coating material by weight to 1 part of 'seed', greatly increasing seed weights and affecting sowing rates. Also, the actual size and weight of caryopses (seeds removed from the floret) of different tropical perennial grasses varies widely as shown in the table below, as does their germination percentage. All of this variation makes it difficult to be prescriptive about sowing rate in terms of the weight of seeds (kg/ha) that need to be sown to achieve a good plant density.

NSW GOVERNMENT Industry & Investment

Cultivar	Seed weight (g) per 100 seeds	Number of seeds per kg
Bambatsi	0.093	1,075,300
Premier	0.043	2,325,600
Petrie	0.062	1,626,020
Gatton	0.068	1,470,600
Narok	0.114	877,200
Inverell	0.104	961,500
American	0.198	505,050
Gayndah	0.285	350,900
Biloela	0.187	534,800
Pioneer	0.037	2,702,700
Callide	0.033	3,030,300
Katambora	0.024	4,166,700
Hatch	0.116	862,100
Floren	0.090	1,111,100
Swann	0.017	5,776,250

Variation in caryopsis (seed removed from the floret) weight and number per kg for a range of tropical perennial grasses. Data provided by W. Scattini and G. Lodge.

As a general rule the larger the seed the more vigorous the seedling, although Katambora Rhodes grass seedlings grow rapidly from a very small seed and Floren bluegrass seedlings tend to grow slowly from a moderately sized seed. For the cultivars listed in the above table, Swann forest bluegrass and Katambora Rhodes grass had the smallest seeds and the buffel grasses Gayndah, American and Biloela the largest seeds. However, it should be noted the data in the table are for caryopses (i.e. seed removed from the floret) and since not all florets contain seeds and not all seeds are viable and can germinate, sowing rates will need to be adjusted to account for these differences.

The best way to calculate sowing rate is to work back from the amount of seed that will need to be sown to establish a *minimum* plant density at establishment of 10 plants per square metre (i.e. 100,000 plants/ha). Research in Queensland (W. Scattini, pers. comm.) indicates that 17 germinable seeds are required to establish one plant. Therefore, a minimum of 10 plants/m^2, requires 170 germinable seeds/m^2 to be sown (i.e. 1.7 million germinable seeds/ha).

Purity and germination, determined in a seed test analysis, are used to calculate pure live seeds (PLS). It is a combination of the seed size (number and weight of seeds) and the PLS value for a seed sample that will determine the sowing rate required to achieve the minimum plant density. If all 'seeds' were caryopses and all were germinable then the purity and germination percentage would be 100% and the PLS would be 1, but this is highly unlikely to occur and so sowing rates will need to be adjusted upwards to compensate for both lower purity and germination. The following table indicates the effects of declining seed purity and seed germination on the sowing rate of a range of tropical perennial grass cultivars.

Cultivar	Sowing rate (kg/ha)			
	PLS=1.0	PLS=0.49	PLS=0.25	PLS=0.09
Bambatsi	1.6	3.2	6.3	17.6
Premier	0.7	1.5	2.9	8.1
Petrie	1.0	2.1	4.2	11.6
Gatton	1.2	2.4	4.6	12.8
Narok	1.9	4.0	7.8	21.5
Inverell	1.8	3.6	7.1	19.6
American	3.4	6.9	13.5	37.4
Gayndah	4.8	9.9	19.4	53.8
Biloela	3.2	6.5	12.7	36.3
Pioneer	0.6	1.3	2.5	7.0
Callide	0.6	1.1	2.2	6.2
Katambora	0.4	0.8	1.6	4.5
Hatch	2.0	4.0	7.9	21.9
Floren	1.5	3.1	6.1	17.0
Swann	0.3	0.6	1.2	3.3

Effect of the declining proportion of pure live seeds (PLS) on the sowing rate required to achieve a minimum plant density of 10 plants/m^2 at establishment. For a PLS of 1.0, seed purity and germination would both be 100%; for a PLS of 0.49, they would both be 70% (i.e. 0.7 x 0.7); for a PLS of 0.25, they would be 50%, and for a PLS of 0.09, they would be 30%.

As shown in the above table, the sowing rate for 'seed' that has 50% purity and 50% germination would need to be increased by four-fold (0.5 x 0.5 = 0.25 and 1/0.25 = 4). As the proportion of PLS declines from 1 towards 0, the sowing rate of all cultivars in the above table increases markedly,

particularly so for those with larger seeds that need to be sown at a higher rate to achieve the minimum plant density at establishment of 10 plants/m^2. This will also affect the cost of seed. For example, at a nominal cost of $20 per kg for Bambatsi panic seed, the cost of seed with a PLS of 0.49 (70% germination and 70% purity) would be $64 per ha ($20 x 3.2). This cost would increase to $126 per ha for seed with a PLS of 0.25 (50% germination and 50% purity) and $352 per ha for seed with a PLS of 0.09 (30% germination and 30% purity).

The average PLS values for a range of commonly sown tropical perennial grasses were obtained from 160 seed test certificates. As a guide, these data together with estimates of seed size, were used to calculate the required sowing rate to achieve a minimum plant density of 10 plants/m^2, and are shown in the following table.

Cultivar	PLS	Sowing rate (kg/ha)
Bambatsi	0.570	2.8
Premier	0.396	1.8
Inverell	0.244	7.2
Katambora	0.517	0.8
Floren	0.219	7.0
Swann	0.307	1.0

Average PLS (pure live seed) of some tropical grasses (based on seed test certificates) and the sowing rates required to achieve 10 plants/m^2.

This table again shows that there is a distinct cost advantage in sowing seeds with higher purity and germination. However, it needs to be emphasised that a plant density of 10 plants/m^2 is the *minimum* and higher sowing rates are desirable.

The same principles apply to the cost of sowing coated seed. All seed is sold by weight with prices quoted in $ per kg of seed. However, a 2:1 seed coating (2 kg of seed coating to 1 kg of 'seed' by weight) will additionally increase the sowing rate 3-fold; a 4:1 seed coating will increase sowing rate by 5-fold. Therefore for the same seed quality (purity, germination and proportion of other seeds) it is usually more cost effective to buy seed in the floret and increase the sowing rate than it is to buy coated seed.

Further reading

The department's website
www.industry.nsw.gov.au
contains other useful information.

ISSN 1832-6668

Check for updates of this Primefact at:
www.dpi.nsw.gov.au/primefacts

Job number 10087 PUB10/94