Dry Season Regrowth of Six Forage Species Following Wildfire

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Highlight: The regrowth of three introduced perennial grasses, buffelgrass, Pangolagrass, and Sabigrass; one native perennial grass, sehima; and two perennial legumes, Caribbean stylo and leucaena, after a dry season wildfire was studied in northern Australia. The native grass produced similar quantities of dry matter during the dry season but was of lower digestibility and crude protein content than all other species. Crude protein yield per hectare was highest for Sabigrass during the dry season. After the onset of the wet season the native grass produced significantly more dry matter and crude protein per hectare than all other species. Neither of the legumes provided large amounts of feed during the dry season. It is suggested that introduced grasses may be of greater value after a fire while native grasses may be superior after rains have begun.

The risk of wildfire during the dry season in Northern Australia is very high due to the hot dry weather and constant winds. The large sizes of properties and minimal-input-management preclude any rapid fire control, and the practise of burning native pasture as a management tool increases the risk of uncontrolled fire (Tothill 1971). It has been estimated that the probability of wildfire is one year in five in the high rainfall zone of the Northern Territory, although there is a great variation between areas.

This fire risk is considered to be one of the greater uncertainty factors associated with sowing improved pastures. Sturtz (1966) noted that fire resistance is required in introduced species.

Wesley-Smith (1970) has shown that dry season fire does not always lower the re-establishment of the annual species Townsville stylo (Stylosanthes humilis) in the following wet season. However, it does cause the loss of pasture for dry season grazing. Sturtz (personal communication) has screened a range of introduced pasture species for persistence after burning. However, the effect of fire on feed availability until the following wet season is largely unknown.

This paper reports the dry matter production and nutritive value of four perennial grasses (one native) and two perennial legumes after a dry season wildfire.

Methods

The effects of a dry season wildfire were measured at Douglas Daly Experiment Station about 160 km south of Darwin in the Northern Territory of Australia. The experiment station is situated in a monsoonal region receiving an annual average rainfall of 1,100 mm, more than 90% of which falls between November and May.

An area of plots which had been established for 2 years on a Tippera clay loam soil was burned in a fast wind-driven fire which consumed all dead and green material. The fire took place on a typical dry season day (June 20, 1975), when the temperature was about 33°C and the relative humidity less than 35%. The species growing in these plots were Sabigrass (Urochloa mosambicensis), buffelgrass (Cenchrus ciliaris), Pangolagrass (Digitaria decumbens), Caribbean stylo (Stylosanthes hamata cv. Verano), leucaena (Leucaena leucocephala), and the native grass species sehima (Sehima nervosum).

The rate of regrowth of all species was estimated by hand plucking all green leaves within a 0.2 m² area in five plots of each species at regular intervals. Samples were analyzed for crude protein using the micro-Kjeldahl technique, for phosphorus by reading the absorption at 882 nm, and for in vitro digestibility using a two stage technique developed by Newman (1972).

A Duvdevani dew gauge was used to estimate dew fall, which is presented along with rainfall figures in Table 1.

Table 1. Moisture (mm) received from dew and rain for each month.

<table>
<thead>
<tr>
<th>Moisture source</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dew</td>
<td>4.5</td>
<td>4.8</td>
<td>n.a.</td>
<td>21.2</td>
<td>44.2</td>
</tr>
<tr>
<td>Rain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

°Not available.

Results

The dry matter production of all species is presented in Table 2. Yields of all grass species were similar up to 40 days of regrowth (January 30, 1975). After that time, sehima produced the most dry matter, followed by Sabigrass. By 83 days of regrowth (September 11, 1975), sehima had produced significantly more dry matter than any other species. By 103 days of regrowth, the yields of Sabigrass and buffelgrass had risen so that they did not vary significantly from that of sehima. By 146 days of regrowth (November 3, 1975), all species had shown large increases in dry matter yields. Sehima produced signifi-
stantly more dry matter than buffelgrass, which produced significantly more than Sabigrass and Pangolagrass. A depression in yield was recorded at 175 days of regrowth (December 2, 1975) for sehima and buffelgrass. Verano produced negligible amounts of dry matter up to 146 days of regrowth (November 3, 1975).

The in vitro digestibility of all species is presented in Table 3. Sehima showed a lower digestibility than all other species at each date. Sabigrass tended to have a slightly higher digestibility than buffelgrass which was in general higher than Pangolagrass. The digestibility of all species tended to decline with time although this effect was much less for leucaena.

Table 3. The in vitro digestibility (% dry matter) of six species after burning.

<table>
<thead>
<tr>
<th>Species</th>
<th>Date of regrowth</th>
<th>Sehima</th>
<th>Sabigrass</th>
<th>Buffelgrass</th>
<th>Pangolagrass</th>
<th>Leucaena</th>
<th>Verano</th>
</tr>
</thead>
<tbody>
<tr>
<td>25/6/75</td>
<td>5</td>
<td>17</td>
<td>16</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>9/7/75</td>
<td>19</td>
<td>31 ab</td>
<td>29 a</td>
<td>20 a</td>
<td>16 a</td>
<td>2 b</td>
<td>0</td>
</tr>
<tr>
<td>21/7/75</td>
<td>31</td>
<td>31 a</td>
<td>38 a</td>
<td>28 a</td>
<td>22 a</td>
<td>16 a</td>
<td>0</td>
</tr>
<tr>
<td>30/7/75</td>
<td>40</td>
<td>50 a</td>
<td>45 ab</td>
<td>27 b</td>
<td>22 b</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>12/8/75</td>
<td>53</td>
<td>90 a</td>
<td>80 a</td>
<td>53 b</td>
<td>52 b</td>
<td>26 c</td>
<td>0</td>
</tr>
<tr>
<td>28/8/75</td>
<td>69</td>
<td>95 a</td>
<td>87 a</td>
<td>87 a</td>
<td>—</td>
<td>65 b</td>
<td>0</td>
</tr>
<tr>
<td>11/9/75</td>
<td>83</td>
<td>183 a</td>
<td>98 b</td>
<td>83 b</td>
<td>50 c</td>
<td>82 b</td>
<td>0</td>
</tr>
<tr>
<td>1/10/75</td>
<td>103</td>
<td>175 a</td>
<td>186 a</td>
<td>140 a</td>
<td>40 b</td>
<td>73 b</td>
<td>0</td>
</tr>
<tr>
<td>21/10/75</td>
<td>123</td>
<td>180 a</td>
<td>197 a</td>
<td>201 a</td>
<td>76 b</td>
<td>150 ab</td>
<td>0</td>
</tr>
<tr>
<td>3/11/75</td>
<td>146</td>
<td>3100 a</td>
<td>555 c</td>
<td>1575 b</td>
<td>460 c</td>
<td>403 c</td>
<td>50 d</td>
</tr>
<tr>
<td>2/12/75</td>
<td>175</td>
<td>1745 a</td>
<td>698 bc</td>
<td>960 b</td>
<td>520 bc</td>
<td>598 bc</td>
<td>100 c</td>
</tr>
</tbody>
</table>

The small differences in the in vitro digestibility figures of the introduced grasses, Sabigrass and buffelgrass, at any one date are not considered to be important. The generally lower in vitro digestibility values of Pangolagrass, however, are important in this situation of feed deficiency. The lower in vitro digestibility values of sehima at all dates also augers against the value of this species during the period after a fire and before rain falls.

The small amounts of regrowth following burning recorded in this experiment are of the same order as those recorded by Arndt and Norman (1959) for native pastures in the Katherine area of the Northern Territory, which receives about 230 mm less rain over a shorter season than the Douglas Daly site.

The dry matter loss recorded for both sehima and buffelgrass may be due to some leaf deaths in a 2-week dry spell because only green leaves were used in these determinations. On the other hand, the large variation may also indicate an error in sampling techniques for November 3, 1975.

Dry matter production is usually considered the most relevant factor immediately after a fire, provided the fire has not been too hot (Smith 1960). However, the low and in some cases similar dry matter yields of grass species determined in this experiment indicate that quality of the herbage available may be of great importance. The quality of feed is indeed critical in this situation of limiting dry matter if the effects of selective grazing on further reducing intake are to be minimized. Sabigrass showed the highest crude protein yields per hectare in the period after the fire before rain fell, and may therefore be of greater value than the native sehima pasture.

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Norman (1963) has previously recorded a response in native pasture species to increased moisture after thunderstorms, and Wesley-Smith (1972) has noted that this response can be more rapid in native than improved species. This response of native species may be due to a translocation of nitrogen and phosphorus to the roots of native grasses at the end of each wet season to allow a quick shoot to the next rains (Norman 1963). Introduced and Norman (1959) for native pastures in the Katherine area of the Northern Territory, which receives about 230 mm less rain over a shorter season than the Douglas Daly site.

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Discussion

The small amounts of regrowth following burning recorded in this experiment are of the same order as those recorded by Arndt and Norman (1959) for native pastures in the Katherine area of the Northern Territory, which receives about 230 mm less rain over a shorter season than the Douglas Daly site.
species continue to grow in the dry season to a limited extent and may not have such root reserves. Their ability to grow with only slight moisture inputs indicates an efficient moisture use in this growth stage. Sehima produced the highest crude protein yield per hectare after the first rains due to this large dry matter response. Thus it appears that this native pasture may be of greater value than introduced grasses in the very early wet season period.

Neither of the legumes examined appeared to be of great value in providing feed after wildfire. Leucaena produced a small amount of high quality forage through the dry season, while Verano did not produce any available feed until rain had fallen.

The results of this experiment indicated that in the event of wildfire, introduced grasses may provide better nutrition through the remainder of the dry season. During the early wet season, however, native pastures may be of greater value.

**Literature Cited**


