Title	**Pasture feed quality in central Queensland**
Location	'Brigalow Research Station', Theodore, 'Rowanlea', Calliope and 'Berrigurra', Blackwater
Experimental staff	I. Loxton[1], P. Martin[2], S. van der Mark[3], T. James[4] and P. Filet[5] [1] QDPI, Rockhampton [2] QDPI, Animal Research Institute, Yeerongpilly [3] CSIRO, Rockhampton, (formerly QDPI Rockhampton) [4] QDPI, Charters Towers, formerly Brigalow Research Station [5] QDPI, Emerald
Duration	1990 – 1994

Summary

The overall quality of a number of pasture species on offer to beef cattle in central Queensland was variable. Nitrogen contents ranged from deficient to adequate depending on the seasonal conditions, while metabolisable energy was more likely to be marginally deficient at most times. Protein supplements and/or grain based rations offer the potential to overcome these deficiencies. The best quality on offer was recorded from green leaf components of the major pasture grass species and leucaena. Grab samples from speargrass and bluegrass, both native grasses; sown grasses, buffel grass and rhodes grass and the legumes, leucaena, siratro, Wyn cassia and Seca stylo were collected on different occasions and from different locations. The pasture samples were often specific to a location. Collections occurred in either the winter of 1990 or 1993, winter-spring of 1991 or the spring-summer period of 1992. On some occasions only limited sample material was available.

The study was undertaken over seasons that were considered drier than normal which may have influenced the pasture quality. The rainfall pattern generally influenced the proportion of green leaf of the grass species.

At a subcoastal location near Calliope, the native grasses, speargrass and bluegrass were often deficient in nitrogen, phosphorus and metabolisable energy and had low dry matter digestibility, particularly over the winter-spring period. Over the spring-summer period, quality improved significantly, however, metabolisable energy levels were often still low.

Rhodes grass was generally of a higher quality than the native grasses at the subcoastal site. On higher fertility soils at Brigalow Research Station, Theodore, or Blackwater, buffel grass or rhodes grass green leaf was often variable in quality over the winter-spring being low in nitrogen with metabolisable energy almost deficient and low dry matter digestibility. Over the spring-summer period, quality was significantly improved with high levels of nitrogen (>2%) being recorded. Although metabolisable energy values were normal, values were still considered low with values of 7–8 MJ/kg DM only being recorded. There was little difference in the quality of buffel or rhodes grass. The apparent quality of the green leaf component on offer in spring-summer was often sufficient for growth and production, however, this potential may have been constrained by the limited quantity available.

All the legume species regardless of location were high in nitrogen content, generally higher than the grasses. Leucaena nitrogen content approached 3%, while nitrogen contents of siratro, Wyn cassia and Seca were generally in the 1–2% range with higher values in the spring-summer period. All the legume species were still low in metabolisable energy content and on occasions considered deficient, particularly in the winter-spring period. Even when metabolisable energy was considered adequate i.e >7 MJ/kg DM, values recorded were still low at 7–8 MJ/kg DM by comparison with other pasture species. At all locations and on most occasions except for some spring-summer samplings phosphorus was considered deficient in siratro, Wyn cassia and Seca stylo, but not in leucaena. At the subcoastal site, siratro was considered to be of higher quality than Wyn cassia or Seca stylo.

Overall, there was no clear decline in pasture quality with time over the winter-spring period or subsequent improvement in quality over the spring-summer period. Any apparent trends were inconsistent.

Like similar studies, this study highlights that pasture quality analysis indicates the apparent dietary quality on offer to the animal and does not allow for the fact that animals may select a diet higher in quality than that indicated by chemical analysis.

Objectives

To monitor pasture feed quality during the winter-spring period at three central Queensland sites and relate that feed quality to animal performance.

To use the relationships between feed quality and animal performance to indicate the need for further nutritional inputs.

Background

The experiment was conducted under Task 3 'Maximising annual growth rates and surplus maiden heifers to reduce age of turnoff'.

Growth rate studies in the brigalow region of central Queensland identified periods of low growth rate in animals over 450-500 kg liveweight and in particular during the winter-spring period. Poor feed quality, possibly an energy deficiency, was implicated.

In sub coastal speargrass regions of central Queensland there was little information on the whole of life productivity of steers and feed quality deficiencies particularly during the winter-spring period.

The winter-spring period was initially targeted due to its low rainfall and secondly it is a period when severe frosting can occur. In the latter stages of the experiment, sampling was extended to cover the seasonal spring-summer break.

Due to the lack of knowledge on the quality of pastures either native or sown in the central Queensland region, there was little basis on which to recommend nutritional inputs to increase animal performance. Collection of pasture samples for analysis of quality in this experiment may provide preliminary information on which to calculate additional nutritional inputs. Alternative approaches to the procedures in this experiment involve dietary studies which require significantly greater resources to undertake.

Method

Sampling was carried out at three locations to obtain samples pre-frost (1991, 1992 and 1993), post-frost (1991 and 1992) and just prior to the onset of new summer growth (1992). The locations were:

'Brigalow Research Station', Theodore - buffel grass, rhodes grass predominate with some Seca stylo.

'Rowanlea', Calliope - native pasture, rhodes grass, Seca stylo, Wynn cassia.

'Berrigurra', Blackwater - predominantly buffel grass, some rhodes grass and leucaena.

An initial sampling was carried out at Calliope and Blackwater in July 1990 to establish sampling techniques and a protocol.

Depending on the location, the number of sites sampled per paddock varied from two to five. Two paddocks were regularly sampled at Brigalow (buffel-rhodes grass paddock, buffel-rhodes grass and Seca stylo paddock) and Calliope (native pasture paddock, native pasture-sown pasture paddock) and one paddock at Blackwater (buffel grass, with some rhodes grass).

At the initial sampling in July 1990, three paddocks were sampled at Calliope (two native pasture paddocks and one native pasture-sown pasture paddock) and two paddocks at Blackwater (one paddock of buffel grass with some rhodes grass and one paddock with leucaena in rows and inter row grass strips).

Stocking rates at each location were conservative. At Calliope, stocking rates approximated 1 steer/2.5 ha in the native pasture paddock. At Brigalow, approximate stocking rates ranged from 1 steer/2 ha (weaners) to 1 steer/2.5 ha (yearling - two year old steers). At Blackwater, approximate stocking rates ranged from 1 steer/2.4 ha (weaners) to 1 steer/3.1 ha (yearling - two year old steers). At Blackwater, due to drought conditions stocking rates remained at about 1 steer/3 ha.

Pasture yields and composition were estimated using the Botanal technique twice per year at Brigalow in 1991 and 1992 and once per year in June 1991 and May 1992 at Blackwater.

Grab samples were taken from the major species present at a sampling site within each paddock. Dependant on the seasonal conditions and the amount of green material present the grass samples were sorted into green leaf, green stem and dead material components. If insufficient green material was available for sorting, samples were presented on a whole plant basis. Samples from legumes were preferably selected from the non woody, herbaceous stems, leaf and growing points of the plant. Legume samples were not sorted into components. Overall, plant material sampled was that most likely to represent that selected by stock.

All samples were handled using a defined protocol. Sufficient of each plant component was selected/sorted for chemical analysis and for dry matter determination. Fresh samples for chemical analysis were transported on ice until dried at 100°C for approximately one hour to halt respiration. Dry matter samples were dried at 80°C for 24 hours from which the dry matter of each plant component was calculated. On this basis, the proportion of each component eg. leaf:stem ratios could be calculated.

The plant components were analysed for dry matter, nitrogen (N), ash and phosphorus (P) content by standard methods (AOAC 1980), while dry matter (DMD), organic matter digestibility (OMD) and metabolisable energy (ME) were determined using an *in vitro* technique.

Because of the fibrous nature of Seca stylo and concerns relating to actual sampling technique of this plant, acid detergent figure content (ADF) was determined using the Filtrex method (Faichney and White 1983). In addition, ME was also predicted using equation 67 (Technical Bulletin 33, 1975). The equation is:

$$ME = 13.5 - 0.15\ ADF - 0.14\ Crude\ protein.$$

Results and Discussion

Rainfall figures for appropriate periods are included in figures 1–32. In general, over the period of this experiment, falls of rain at each site were often below average with severe dry conditions being recorded in either winter dry season periods or summer wet season periods. The most pronounced and harsh seasonal conditions were recorded at Blackwater leading to almost drought conditions towards the end of 1992.

Pasture yield and composition data where available are shown in Table 1.

Pasture yields at both Brigalow and Blackwater were considered adequate on all sampling occasions, although November 1991 yields at Brigalow were at their lowest. The influence of the drier seasons was evident in the May 1992 yields at Blackwater. Of the two paddocks monitored at Brigalow, buffel grass was the major grass species in the buffel grass paddock though only just, with rhodes grass the other major species. In the buffel grass-Seca stylo paddock buffel grass was the dominant grass species.

The contribution of Seca stylo to the composition of the buffel grass-Seca stylo paddock at Brigalow was low at all sampling. Stylo density values were also low.

At Blackwater, buffel grass was the dominant pasture species on both sampling occasions. Even though pasture yield and composition data were not available from Calliope, dry matter was never considered to be limiting.

Results of the pasture quality analyses are shown in Tables 2–11 and figures 1–32. These data can be used as a guide to feed quality and it is emphasised these data represent the pasture quality on offer to cattle and may not represent exactly the quality of the diet actually selected by animals.

As a guide to interpretation, suggested normal values on a dry matter basis are nitrogen content <0.5% is low, ash content >10% is high, phosphorus content <0.10% is low, dry matter digestibility <40% is low and metabolisable energy <7 MJ/kg DM is low.

Calliope

At the initial sampling at Calliope in July 1990 (Table 2), N and P contents of both speargrass and bluegrass green components were similar and values were considered in the normal range. Ash content of the green leaf components of both speargrass and bluegrass was considered too high, while DMD and ME values of the speargrass were lower than bluegrass. The speargrass components were considered deficient. Bluegrass green leaf DMD values were acceptable.

All quality values for the rhodes grass green leaf component were more similar to speargrass values rather than the bluegrass values, except for ash content. Nutritional value of the rhodes grass was expected to be higher, however, light frosting of the rhodes grass area and not the native grass area may explain this result.

The legumes, siratro, Wyn cassia and Seca stylo generally had higher N content, lower ash content and higher DMD and ME values than the grasses, except Wyn Cassia DMD and Seca stylo ME values. All the legume species had lower P values than the grasses.

Rhodes grass green components sampled in April, August and October 1991 (Table 4 and Fig. 1) were deficient in N on occasions, had normal ash values, were generally deficient in ME and on some occasions had low DMD values. As expected, parameter values of the dead material were low, while ash contents were generally acceptable. Over the three samplings in 1991 there was no general decline in quality of all components. Green stem N, DMD and ME content declined in quality over these three samplings. These results reflect the decline in the proportion of green components, a function of the poor rainfall during 1991. Speargrass growing in the same paddock as the rhodes grass (Table 4 and Fig. 2) was generally of low quality with most parameters recording values outside the normal range.

The legumes, siratro and Wyn cassia were both of higher quality than the rhodes grass apart from the low P content (Table 4, Figs 3 and 4). Parameter values were in the normal range except for the lower Wyn cassia ME value which was outside the normal range. Mean liveweights of steers in the improved pasture paddock (illustrated in Figures 1 to 4) indicate that quality of the plant components were sufficient to sustain animal growth between March and June. As the quality of critical components declined, liveweight losses were recorded.

Quality of the speargrass and bluegrass plant components from the native pasture paddock in 1991 were generally low, and below normal values, with the exception of the bluegrass green leaf component in April 1991 (Table 4 and Figs 5 and 6). Apart from the higher values of the bluegrass green leaf in April, quality of the speargrass and bluegrass components were similar. Accordingly, liveweight gains were lower on this pasture (illustrated in Figs 5 and 6). The results of these native grasses suggest component quality declined marginally over time.

In 1992, sampling was designed to monitor pasture quality over late winter, spring and early summer. Results of the rhodes grass components are shown in Table 7 and Figure 14. Rainfalls over the 1992 monitoring period were average to above average, however, benefit of this rainfall was not reflected in the proportions of green components recorded. Quality of the green leaf component was generally adequate, however ash contents were higher than desired and ME values were still marginal. Quality of the other rhodes grass components, green stem/green material and dead material was still considered low. Parameter values either remained similar at each sampling (green leaf component N, DMD and ME) or declined in value (green stem component DMD and ME). Speargrass sampled in the same paddock was still of low value, even the green leaf component (Table 7 and Fig. 15).

The legumes, siratro, Wyn cassia and Seca stylo all responded to the favourable rainfall received over the monitoring period of 1992. Dry matter values of each legume species declined significantly from August to December (Table 7 and Figs 16–18). On each sampling occasion, N contents of each species were adequate and considered high in December 1992 for all species, ash contents were desirably low, DMD values were normal apart from the unacceptably low Seca stylo values in October and ME values were normal, although only just above the threshold of 7 MJ/kg DM. Acid detergent fibre (ADF) data of Table 11 of Seca stylo samples collected in October 1992 were high indicating low quality, while values in December 1992 and June 1993 were considered normal. The predicted ME values of Table 11 are of interest and it should be noted there was a similar trend to the *in vitro* determined ME values of Tables 7 and 8, however, the magnitude of the predicted ME values of Table 11 were higher. P contents were generally adequate for all legume species.

Although mean liveweights of steers in this paddock were not available for the actual sampling months, an overall positive trend in liveweight gains from this paddock was apparent (Figs 14–18).

Native pasture grass species sampled from the native pasture paddock responded significantly to the rainfall in respect to the proportion of green components available (Table 7 and Figs 19 and 20). Green leaf components were of higher quality following significant rainfall. However, data from this paddock are somewhat confused due to the burning of some of the sampled areas and the different bluegrass species. For this reason data are presented from both the unburnt and burnt areas.

Green leaf P contents were adequate, DMD values normal while ME values still tended to be low. Green stem and dead material component parameter values where recorded, were still considered low. There were no clear differences in quality between the samples from either the unburnt or burnt areas. The data of Figures 19 and 20 suggest that pasture quality peaked in October 1992 for speargrass and in August 1992 for bluegrass. As with the improved pasture paddock, steer liveweights were not always recorded in the sampling months. However, liveweight trends suggest gains were achieved over the monitoring period.

In 1993, only one collection was made due to the failure of the 1992/1993 wet season. This sample was collected from the improved pasture paddock only, in June 1993 before the season ??????? and pasture conditions deteriorated further. Quality of both the rhodes grass and speargrass components were low, with the rhodes grass of slightly better quality than the speargrass (Table 10 and Figs 28 and 29). Both grass species were considered deficient in all analysed nutrients except P content, while rhodes grass components were considered normal.

Quality of the legume species siratro, Wyn cassia and Seca stylo was higher than the grass components with normal values for N, ash, P and DMD recorded (Table 10 and Figs 30–32). As was recorded in previous samplings, ME values were below normal in these three legume species.

Data from the 1991 winter-spring collections suggest that all grasses were nutritionally deficient and that legumes were of higher quality in respect to nitrogen. Over the winter, spring and early summer of 1992, grass quality was much improved for both sown and native pasture species. Legume quality was also improved, with phosphorus values considered normal.

Brigalow

Sampling commenced at Brigalow in April 1991. Quality of the green components of both buffel grass and rhodes grass in the sown grass paddock was variable (Table 5 and Figures 7 and 8). Nitrogen content of the green leaf was generally adequate, but not always adequate in the green stem. Ash contents of the green leaf was often higher than desired while P contents were adequate on most occasions. Dry matter digestibility values were sometimes adequate, however, ME values were generally below the threshold of 7 MJ/kg DM. Quality of the non green components or the whole plant samples was predictably lower than the quality of the green leaf components of both grass species. Any trends in quality differences between the two grass species were inconsistent.

Quality of both species did not necessarily decline across the three sampling occasions. Buffel grass whole plant samples recorded the highest quality in August 1991 (Fig. 7), while rhodes grass quality improved in October 1991 compared to August 1991 (Fig. 8). These trends are not easily explained by the rainfall pattern, nor the proportion of green component which did not appear to reflect the rainfall pattern.

The magnitude of parameter values for both the buffel grass and rhodes grass samples from the sown grass-Seca stylo paddock (Table 5 and Figs 9 and 10) are similar to the results discussed above for the same species in the sown grass paddock. There was little difference between the grass species in nutritional quality. The only difference between the two paddocks was that for some quality attributes, quality was lower in August for both grass species in the sown grass-Seca stylo paddock.

Seca stylo samples from Brigalow in 1991 were of lower quality than expected (Table 5 and Fig. 11). Although N content was considered adequate, values were still lower than expected. Values of P, DMD and ME were low suggesting this species was nutritionally deficient for animal production over these sampling periods.

Samplings in 1992 were made in late winter, spring and early summer (December). Results of the buffel grass components were similar from both the sown grass (Table 8 and Fig. 21) and sown grass-Seca stylo paddocks (Table 8 and Fig. 23). A similar result was recorded for the rhodes grass components from the same paddocks (Table 8 and Figs 22 and 24).

The proportions of buffel grass green leaf and stem over the 1992 sampling reflect the rainfall pattern. Nitrogen contents of buffel grass green leaf from both paddocks was adequate on all occasions and highest in December 1992. Phosphorus, DMD and ME values were in the normal range, while green leaf ash contents were higher than desired. Parameter values of the buffel grass green stem component were below normal, except for ash and P values. Dead material quality parameter values were well below normal as expected. Where buffel grass whole plant samples were collected, quality parameters were generally at or just below normal values in both paddocks.

Results of the rhodes grass sampling in 1992 from both paddocks (Table 8 and Figs 22 and 24) suggest green leaf quality to be slightly inferior to buffel grass in respect to N, DMD and ME values. The same trend did not apply to the rhodes grass green stem component which appeared superior in quality to the buffel grass. Dead material values were similar to buffel grass. Quality of the rhodes grass green leaf component was acceptable in respect to N, P and DMD content but not ME. In contrast, ME values of buffel grass green leaf were in the normal range. Values of the green stem component were below normal in samples from both paddocks, except for ash and P content at each sampling, and DMD from the sown grass paddock in December 1992.

The December 1992 results are interesting despite the favourable rainfall patterns of November and December 1992. Although dry matter values were low, the proportion of green leaf and green stem in both grass species was lower than expected in both paddocks. The results also indicate that the proportion of green leaf and green stem was higher in grass samples from the sown grass paddock, compared to the sown grass-Seca stylo paddock.

Seca stylo samples collected in 1992 were adequate in N, were either slightly deficient or adequate in P, had acceptable ash contents, had unacceptable DMD values and were deficient in ME (Table 8 and Fig. 25). However, in general, results were better than values recorded for the 1991 sampling. The ADF results (Table 11) indicate values were higher than desired and generally higher than that recorded from the smaller number of samples collected at Calliope. As discussed previously for the Calliope Seca samples, predicted ME values of the Brigalow samples were higher than the ME values from *in vitro* determination (Table 11).

The data from winter-spring 1991 and spring-summer 1992 sampling at Brigalow Research Station indicates that pasture quality of grass and legume species was likely to be deficient for animal production on occasions. In particular, green components of the grass species were variable in N content, adequate in P content, often had unacceptably high ash contents, variable in DMD and quite often deficient in ME. Seca stylo was always adequate in N, nearly always deficient in P, had acceptable ash content, high (unacceptable) ADF values, low DMD values and was deficient in ME.

Liveweight performance on the two individual pasture quality sampled paddocks was not available as treatment groups were rotated monthly through either six buffel/rhodes grass paddocks or six buffel/rhodes grass-Seca stylo paddocks. The same two paddocks out of 12 were sampled for pasture quality determination (see Method). However, over the entire experimental area, positive liveweight gains were achieved over both the 1991 and 1992 sampling periods, highlighting the ability of animals to select a better quality diet than was apparent from the results of the two sampled paddocks.

Although on a number of occasions, the pasture was considered to be nutritionally deficient, animals still achieved liveweight gains while contemporary animals offered *ad lib* grain rations through self feeders had increases in liveweight performance of up to 22% in 1991 and 24% in 1992 (increases calculated as liveweight change advantage expressed as a percentage of control animals liveweight). These results highlight the advantage when additional nitrogen and energy are supplied to grazing animals.

Blackwater

The initial sampling at Blackwater in July 1990 allowed the quality of leucaena and a range of grasses to be determined. Leucaena samples (collected from growing leaves and stems at the extremities of the plant) were high in N, P, DMD and adequate in ME. Ash content was higher than desirable (Table 3). The most outstanding feature of the leucaena was the very high N content. Rhodes grass collected between the leucaena rows was of slightly higher quality than samples collected in the same paddock, from pasture adjacent to the leucaena. Rhodes grass green component samples were adequate in N, P, DMD and ME. Ash content was again higher than desired.

Comparison of the quality of whole plant rhodes grass and purple pigeon grass collected between the leucaena rows was possible (Table 3). The rhodes grass was of higher quality than the purple pigeon grass.

Rhodes grass green component samples collected from the pasture area adjacent to the leucaena rows was also of adequate quality, although as stated above, values were slightly lower than the same components collected from between the leucaena rows. Comparisons of whole plant samples of rhodes grass, purple pigeon grass and buffel grass all collected from the pasture adjacent to the leucaena rows was also possible (Table 3). The results indicate the buffel grass was of slightly higher quality than rhodes grass and purple pigeon grass, the two latter species being similar in quality.

In a separate paddock that would continue to be monitored in 1991 and 1992, buffel grass components were sampled in July 1990. Buffel grass green leaf was high in N, P, DMD and ME (Table 3). Ash content was higher than desired. Of interest was the high ME value. Green stem quality was adequate for most quality parameters except ME which was low.

In 1991, rainfall and therefore green components were limited, and for this reason continuity of sample components was not achieved. Despite the limited rainfall, quality of the limited rhodes grass green leaf on offer was high in respect to N content, adequate in P, DMD and ME (Table 3 and Figure 12). Green stem quality was of reasonable quality. There was no decline in quality between April and August 1991. For a comparison of quality including October, rhodes grass whole plant data was only available. The results highlight the decline in quality from April 1991 to October 1991, especially in relation to N, P, DMD and ME.

Buffel grass green leaf quality was quite different in August 1991 compared to April 1991 (Table 6 and Fig. 13). The apparent low quality of the green leaf in April 1991 is not understood. The buffel grass green leaf quality of August 1991 was high for all parameters though the proportion of green leaf was limiting. Quality parameters of the buffel grass green stem were similar over the three sampling in 1991. The results suggest that green stem proportions were high in August and October 1991 and possibly would have contributed to much of the animals dietary intake. Values for the buffel grass dead material were as expected, however, ME values were higher than expected and were similar to those of green stem.

The limited quantity of buffel grass sampling material available in October 1991 was treated as green material only (Table 6 and Fig. 13). Although the proportion of green material was limiting, quality was acceptable for all parameters. Liveweight performance of steers in the sampled paddock is shown in Figure 12. Although pasture components were often of reasonable quality, the limited quantity of material resulted in only small liveweight gains being achieved by steers between April and October 1991.

In 1992, at Blackwater as in 1991, rainfall was limiting, the proportion of green components was low resulting in an inability to continuously sample similar components over time. As at Brigalow in 1992, samples were collected in late winter, spring and early summer. All rhodes grass components were only sampled in August 1992 (Table 9 and Fig. 26) and on this occasion the green leaf component although very limited in quantity was of very high quality. The other components were of expected quality. Any discussion on the change in rhodes grass quality over 1992 is not possible.

Despite the low rainfall over the monitoring period, the proportion of buffel grass green leaf was greater than expected and possibly could have contributed significantly to the animals dietary intake. The green leaf component was of high quality in both August and December 1992 (Table 9 and Fig. 27). The only decline in quality between these two sampling occasions occurred in N content, with lower values in December 1992. Both rhodes grass and buffel grass green leaf components were of similar quality in August 1992, the major difference being the very limited proportion of rhodes grass green leaf available.

Quality of the buffel grass green stem component was as expected with a reasonable proportion of this component available in August and December 1992, despite the limited rainfall. In October 1992, limited green components were available and for this reason data for green material only are presented which could not be differentiated into green leaf and green stem. There was a reasonable amount of this green material available in October 1992. Quality was not high, with this green material considered nutritionally deficient for animal growth.

Mean liveweights of weaner steers grazing the sampled paddock in 1992 are shown in Figure 27. While some of these liveweights were collected in different months to the sampling occasions, these liveweights can only provide a guide to performance over the months of sampling. The data of Figure 27 suggests that liveweight gains were achieved over the sampling months.

The data from the winter 1990, winter-spring 1991 and spring-summer 1992 sampling at Blackwater indicates that the quality of leucaena in 1990 was high, the quality of the green leaf components of both rhodes grass and buffel grass was high although limited in quantity. Nitrogen content of leucaena was much higher than the grass species. These data indicate the potential of these species to promote animal growth when not constrained by poor rainfall and limited quantity of such components. In a number of cases, P contents at Blackwater were often lower in the same species than was recorded at Brigalow on similar sampling occasions. This may be a function of the different soil types. Also, when comparing Blackwater and Brigalow, the quality of green components of the same species was often higher at Blackwater, in particular, N, DMD and ME values. This difference between the two locations cannot be explained.

Conclusion

Native pasture grass species, speargrass and bluegrass, were generally of variable but low quality in both the winter-spring and spring-summer samples. Green leaf components were generally deficient in N, P, ME and had low DMD, although green leaf components in summer were adequate in N. With increasing rainfall in late spring-early summer, the green proportion of these pasture grasses increased accordingly. There was little difference in quality between speargrass and bluegrass.

The quality of the sown grasses, buffel and rhodes was also variable ranging from nutritionally deficient to excellent quality depending on location, season and soil type. The seasonal conditions over the period of this study were considered quite dry with below average rainfalls. During the winter-spring period, green leaf components were adequate in N and P, variable in DMD, deficient or borderline in ME and higher ash contents than desired. Quantity and quality of the green leaf components improved with increasing rainfall over the spring-summer period. ME content was generally lower than expected on most occasions except for a collection made at Blackwater in July 1990 when values >8 MJ/kg DM were recorded. Green stem was of lower quality than green leaf. Overall, there was little difference in quality between buffel grass and rhodes grass. If any differences were apparent, they were inconsistent. Limited data suggests purple pigeon grass to be of lower quality than both buffel and rhodes grasses. Legumes were generally of higher N content than both native and sown grass species. Leucaena collected at Blackwater in July 1990 was of exceptional N content, high P content, high DMD, yet only recorded an adequate, but marginal ME of 7.5 MJ/kg DM.

The legumes siratro, Wyn cassia and Seca stylo all collected at Calliope on subcoastal country and Seca stylo collected at Brigalow were generally adequate in N, low in P on most occasions (except summer sampling), adequate DMD values and marginal ME content that was either barely adequate, just deficient or considered to be significantly deficient. Overall, siratro was of higher quality than both Wyn cassia and Seca stylo at Calliope. At Brigalow, although the N content of Seca stylo was adequate, ME was generally low regardless of the seasonal conditions. This result may have been a function of sampling technique.

Overall, there was no clear decline in pasture quality with time over the winter-spring period. Any trends were inconsistent. Quality decline or improvement appeared to be a function of the rainfall pattern.

Despite the variable and sometimes low pasture quality on offer, particularly in the winter-spring period, small liveweight gains were recorded at locations where liveweights were monitored. The potential animal performance from the pastures at the three locations can only be speculated. From nutrient requirements data for beef cattle it would be possible to maintain liveweight of:

300 kg steers consumed >4.5 kg pasture/day (DM basis)
400 kg steers consumed >6.0 kg pasture/day (DM basis)
500 kg steers consumed >7.5 kg pasture/day (DM basis).

This pasture would have a minimum N content of 1.3% and a minimum ME of 7 MJ/kg (all DM basis).

From this study, green leaf was generally the highest quality component of the plant. Leucaena met the above criteria, while none of the native or sown grasses or introduced legumes consistently met this requirement over the winter-spring period. Metabolisable energy was considered marginally deficient or deficient on many sampling occasions coupled with the low quality of green leaf available. The low quantity of green leaf available meant that animals may not be able to satisfy their dry matter requirements to achieve liveweight maintenance. Overall, this data like data from any pasture analysis suffers from the fact that pasture quality analysis indicates the apparent dietary quality on offer to the animal, but does not allow for the fact that animals may select a diet higher in quality than that indicated by chemical analysis. The potential for the inclusion of protein supplements and/or grain based rations into the overall diet of grazing animals in the environments monitored, resulting in marked liveweight gains is apparent. Over the spring-summer period, green leaf components of native grasses (limited extent), sown grasses and the legume species met the above minimum quality criteria for liveweight maintenance.

Acknowledgments

The financial support of the Meat Research Corporation and the support and assistance of QDPI Nutritional Biochemistry technical staff for chemical analysis is gratefully acknowledge. We acknowledge the valuable support of the Chapman family, Rowanlea, Calliope; Mr P. Venamore, Berrigurra, Blackwater and Mr A. Lloyd, Brigalow Research Station, Theodore. The assistance of Mr M. Jeffery, Brigalow Research Station, Theodore; Mr M. Rutherford, QDPI, Rockhampton and Ms J. Wilcocks, QDPI, Emerald in sample collection is gratefully acknowledged.

References

AOAC (1980). Official methods of analysis of the AOAC, 13th edition, Washington, USA.

Faichney, G.J. and White, G.A. (1983). Methods for the analysis of feeds eaten by ruminants pp 10-11 CSIRO, Division of Animal Production: Melbourne.

Technical Bulletin 33 (1975). Energy allowances and feeding systems for ruminants p. 66, Ministry of Agriculture, Fisheries and Food: London, UK.

Table 1. Pasture yields and composition of paddocks monitored for feed quality on offer at two locations in Central Queensland.

Location/site	Date	Yield (kg/ha)	Composition (%)								Seca stylo density (adult plants/m^2)
			Buffel grass	Green panic grass	Rhodes grass	Bluegrass	Button grass	Other grasses	Forbs	Seca stylo	
Brigalow											
Sown grass paddock	May 1991	3 898	39.8	0	41.1	15.3	-	3.7	0.1	0	0
	Nov. 1991	2 395	44.7	0	37.8	11.2	-	6.3	0	0	0
	July 1992	5 294	51.5	0	27.0	16.0	-	5.4	0.1	0	ND[1]
	Nov. 1992	3 144	48.1	0	33.1	9.9	-	8.4	0.5	0	0
Sown grass-Seca stylo paddock	May 1991	4 379	66.1	0.1	29.5	0.6	-	1.2	0	2.5	3.0
	Nov. 1991	2 738	72.2	0.2	20.2	4.9	-	0.7	0	1.8	2.9
	July 1992	5 660	75.2	0	18.5	3.8	-	0.8	0.1	1.6	ND
	Nov. 1992	3 350	74.5	0.1	17.5	2.7	-	1.9	0.1	3.2	4.7
Blackwater											
Sown grass paddock	June 1991	4 109	93.6	-	3.6	-	0.3	2.5	0.05	-	-
	May 1992	2 771	94.5	-	3.3	-	-	2.1	-	-	-

[1] ND - No data available.

Table 2. Chemical analysis of pasture samples collected at Calliope in July 1990 (Dry matter basis).

Component	Dry matter (%)	Proportion green leaf (%)	Proportion green stem (%)	Proportion[a] green material (%)	Nitrogen (%)	Ash (%)	Phosphorus (%)	*in vitro* determination		
								Dry matter digestibility (%)	Organic matter digestibility (%)	Metabolisable energy (ME) (MJ/kg)
Calliope (Rowanlea)										
Speargrass (2 sites overall)										
-Green leaf	80.7 (74.7-86.6)[b]	-	-	-	1.25 (1.20-1.29)	14.6 (11.7-17.4)	0.23 (0.22-0.23)	36.2 (33.0-39.4)	37.5 (34.7-40.2)	4.8 (4.3-5.3)
-Green stem and seedhead	73.4 (68.8-77.9)	-	-	-	0.71 (0.69-0.71)	9.7 (9.1-10.2)	0.18 (0.17-0.19)	32.6 (32.2-33.0)	31.1 (29.5-32.6)	4.4 (4.3-4.4)
-Dead material	73.6 (64.0-83.1)	-	-	-	0.74 (0.66-0.81)	10.4 (10.2-10.6)	0.16 (0.14-0.18)	32.0 (1 site)	32.3 (1 site)	4.3 (1 site)
Bluegrass (2 sites overall)										
-Green leaf	76.6 (71.4-81.8)	-	-	-	1.36 (1.22-1.50)	11.6 (11.6-11.6)	0.25 (0.17-0.33)	49.0 (1 site)	50.6 (1 site)	6.7 (1 site)
-Green stem and seedhead	57.8 (57.5-58.0)	-	-	-	0.68 (0.62-0.73)	7.8 (7.2-8.3)	0.18 (0.10-0.25)	40.7 (40.5-40.8)	39.7 (39.6-39.8)	5.5 (5.4-5.5)
Rhodes grass (3 sites overall)										
-Green leaf	68.1 (59.1-77.5)	-	-	-	1.09 (0.94-1.18)	11.2 (10.1-12.1)	0.27 (0.17-0.45)	39.7 (37.1-39.8)	38.9 (35.3-42.4)	5.2 (4.6-5.7)
-Green stem and seedhead	59.7 (53.7-65.1)	-	-	-	0.62 (0.54-0.69)	7.4 (7.2-7.7)	0.18 (0.12-0.28)	37.6 (35.1-39.0)	36.1 (33.2-37.8)	5.0 (4.6-5.1)
Siratro (2 sites overall)										
-Whole plant	74.8 (67.4-82.1)				1.88 (1.80-1.94)	6.3 (6.1-6.5)	0.14 (0.12-0.15)	51.6 (48.0-55.1)	49.6 (45.6-53.5)	7.0 (6.4-7.5)
Wyn cassia (2 sites overall)										
-Whole plant	63.7 (57.1-70.3)				1.91 (1.90-1.91)	7.9 (6.5-9.2)	0.15 (0.14-0.16)	50.9 (50.1-51.7)	48.6 (48.5-48.6)	6.4 (6.0-6.8)
Seca stylo (1 site only)										
-Whole plant	61.6				1.69	3.9	0.12	46.2	45.1	6.5

[a] *sorted into green material only (that is, mixed leaf/stem) as insufficient of each component to differentiate further*
[b] *range of values shown in parenthesis*

Table 3. Chemical analysis of pasture samples collected at Blackwater in July 1990 (Dry matter basis).

Component	Dry matter (%)	Proportion green leaf (%)	Proportion green stem (%)	Proportion green material (%)	Nitrogen (%)	Ash (%)	Phosphorus (%)	*in vitro* determination		
								Dry matter digestibility (%)	Organic matter digestibility (%)	Metabolisable energy (ME) (MJ/kg)
Blackwater (Berrigurra)										
1. Leucaena + sown grass paddock										
(a) Leucaena (3 sites overall)										
- Whole plant	37.4 (35.0-40.5)[a]				2.96 (1.96-3.89)	12.8 (11.3-15.2)	0.35 (0.20-0.61)	61.7 (60.2-63.2)	57.3 (56.6-57.8)	7.5 (7.3-7.6)
(b) Grass between leucaena rows										
Rhodes grass (2 sites overall)										
- Green leaf	48.4 (43.9-52.8)	-	-	-	1.97 (1.94-1.99)	12.0 (11.3-12.6)	0.36 (0.30-0.41)	61.6 (60.8-62.4)	59.9 (59.2-60.6)	7.9 (7.7-8.0)
- Green stem and seedhead	47.5 (41.6-53.3)	-	-	-	1.28 (0.98-1.57)	12.6 (10.4-14.7)	0.35 (0.31-0.39)	60.3 (56.6-64.0)	56.4 (52.7-60.1)	7.4 (7.0-7.7)
- Whole plant	66.2 (60.4-72.0)				0.99 (0.97-1.01)	9.7 (9.4-9.9)	0.26 (0.24-0.27)	46.5 (43.7-49.2)	43.9 (40.6-47.2)	5.9 (5.5-6.3)
Purple pigeon grass (1 site only)										
- Whole plant	50.6				0.65	11.2	0.24	39.4	38.2	5.1
(c) Grass from open pasture										
Rhodes grass (2 sites overall)										
- Green leaf	52.0 (47.8-56.1)	-	-	-	1.81 (1.71-1.91)	11.8 (11.4-12.2)	0.41 (0.35-0.46)	59.3 (59.0-59.6)	58.4 (58.3-58.5)	7.7 (7.7-7.7)
- Green stem	47.8 (45.4-50.2)	-	-	-	0.97 (0.89-1.05)	11.4 (9.8-12.9)	0.41 (0.36-0.45)	53.8 (48.8-58.8)	50.3 (44.5-56.1)	6.7 (6.0-7.3)
- Whole plant	60.8 (54.2-67.3)				0.87 (0.72-1.01)	10.1 (10.0-10.2)	0.26 (0.17-0.35)	41.4 (39.0-43.7)	37.5 (35.1-39.9)	5.0 (4.7-5.3)
Purple pigeon grass (2 sites overall)										
- Whole plant	66.0 (60.8-71.1)				0.87 (0.85-0.89)	13.7 (13.6-13.7)	0.31 (0.13-0.48)	41.5 (41.3-41.6)	39.5 (38.9-40.1)	5.1 (5.0-5.1)
Buffel grass (3 sites overall)										
- Whole plant	65.3 (62.3-68.1)				1.09 (0.75-1.57)	10.5 (10.1-11.2)	0.25 (0.16-0.38)	45.4 (44.1-46.7)	43.1 (40.1-44.2)	5.7 (5.6-5.7)

[a] *range of values shown in parenthesis*

Table 3. continued

Component	Dry matter (%)	Proportion green leaf (%)	Proportion green stem (%)	Proportion green material (%)	Nitrogen (%)	Ash (%)	Phosphorus (%)	*in vitro* determination		
								Dry matter digestibility (%)	Organic matter digestibility (%)	Metabolisable energy (ME) (MJ/kg)
2. *Sown grass paddock*										
Buffel grass (3 sites overall)										
- Green leaf	63.8 (58.4-71.7)	-	-	-	2.47 (2.28-2.76)	14.7 (13.4-15.9)	0.45 (0.32-0.53)	61.8 (60.8-62.6)	63.4 (62.1-65.1)	8.1 (7.8-8.3)
- Green stem	48.2 (41.4-58.6)	-	-	-	0.91 (0.87-0.94)	9.8 (8.9-11.0)	0.30 (0.17-0.38)	44.8 (43.9-45.5)	43.4 (42.8-43.7)	5.8 (5.7-5.9)

[a] *range of values shown in parenthesis*

Table 4. Chemical analysis of pasture samples collected at Calliope during 1991 (Dry matter basis).

Component	Dry matter (%)	Proportion green leaf (%)	Proportion green stem (%)	Proportion green material (%)	Nitrogen (%)	Ash (%)	Phosphorus (%)	*in vitro* determination: Dry matter digestibility (%)	*in vitro* determination: Organic matter digestibility (%)	*in vitro* determination: Metabolisable energy (ME) (MJ/kg)
Calliope (Rowanlea)										
1. Improved pasture paddock										
Rhodes grass (3 sites overall)										
- Green leaf										
April	50.2	-			0.65	10.5	0.27	45.5	44.4	5.9
	(48.5-51.1)[a]				(0.58-0.70)	(9.7-11.3)	(0.22-0.31)	(44.6-46.2)	(43.2-45.6)	(5.8-6.0)
August	56.8	4.8			0.44	13.3	0.28	40.8	40.2	5.2
	(1 site)	(1 site)								
October	74.2	8.2			0.93	3.6	0.32	50.7	53.9	7.8
	(1 site)	(1 site)								
- Green stem										
April	44.1		-		0.38	6.0	0.20	41.2	38.2	5.3
	(43.8-44.5)				(0.36-0.41)	(5.6-6.4)	(0.19-0.21)	(37.3-43.6)	(34.5-40.1)	(4.8-5.6)
August	52.6		46.7		0.30	4.7	0.22	28.7	26.5	3.8
	(45.1-57.5)		(45.0-50.8)		(0.27-0.33)	(4.1-5.2)	(0.16-0.28)	(22.9-32.3)	(20.8-29.8)	(3.0-4.2)
October	50.3		31.4		0.19	7.7	0.27	26.6	20.6	2.8
	(1 site)		(1 site)							
- Green material (mixed leaf/stem)										
October	83.7				1.26	11.2	0.29	60.1	59.1	7.8
	(1 site)									
- Dead material										
April	85.8				0.28	10.8	0.18	32.4	32.4	4.3
	(84.4-87.9)				(0.27-0.30)	(10.0-11.9)	(0.11-0.29)	(30.5-35.1)	(30.4-35.2)	(4.1-4.7)
August	90.5				0.31	7.2	0.13	30.8	29.9	4.1
	(88.7-91.6)				(0.28-0.37)	(7.1-7.5)	(0.07-0.18)	(25.8-33.6)	(24.2-32.9)	(3.3-4.5)
October	86.0				0.24	9.5	0.19	28.8	25.1	3.4
	(80.3-91.7)				(0.22-0.26)	(7.1-11.9)	(0.17-0.20)	(26.1-31.4)	(20.4-29.8)	(2.6-4.1)
- Whole plant										
October	90.8				0.22	0.9	0.19	29.9	32.1	4.7
	(1 site)									

[a] range of values shown in parenthesis

Table 4. continued

Component	Dry matter (%)	Proportion green leaf (%)	Proportion green stem (%)	Proportion green material (%)	Nitrogen (%)	Ash (%)	Phosphorus (%)	*in vitro* determination		
								Dry matter digestibility (%)	Organic matter digestibility (%)	Metabolisable energy (ME) (MJ/kg)
Speargrass (2 sites overall)										
- Green leaf										
April	72.9				0.55	10.9	0.12	36.6	36.1	4.8
	(70.4-75.4)				(0.54-0.56)	(10.3-11.4)	(0.12-0.12)	(34.9-38.3)	(34.2-37.9)	(4.5-5.1)
- Green stem										
April	59.5				0.33	6.7	0.11	34.3	32.3	4.5
	(59.4-59.6)				(0.30-0.36)	(6.6-6.8)	(0.09-0.12)	(32.2-36.4)	(29.9-34.6)	(4.2-4.8)
- Dead material										
April	87.6				0.32	10.8	0.07	27.4	27.7	3.7
	(87.2-88.0)				(0.29-0.35)	(10.1-11.5)	(0.06-0.07)	(27.3-27.5)	(27.5-27.8)	(3.6-3.7)
- Whole plant										
August	85.1				0.28	9.8	0.08	33.4	33.6	4.5
	(84.7-85.5)				(0.20-0.35)	(7.3-12.3)	(0.04-0.12)	(30.6-36.1)	(30.8-36.4)	(4.0-5.0)
October	90.5				0.27	7.6	0.09	32.8	33.8	4.6
	(88.8-92.2)				(0.24-0.29)	(6.5-8.7)	(0.07-0.12)	(31.3-34.2)	(33.7-33.9)	(4.6-4.6)
Siratro (3 sites overall)										
- Whole plant										
April	42.0				1.86	7.3	0.12	54.2	50.8	7.1
	(40.6-44.3)				(1.74-1.93)	(7.1-7.7)	(0.09-0.15)	(53.6-55.1)	(50.3-51.6)	(7.0-7.1)
Wyn cassia										
- Whole plant										
April	47.6				1.18	5.6	0.08	43.7	40.9	5.7
	(1 site)									
2. *Native pasture paddock*										
Speargrass (1 site only)										
- Green leaf										
April	74.4	-			0.58	11.7	0.09	29.3	29.1	3.8
August	90.0	20			0.51	8.8	0.15	28.4	27.3	3.7
- Green stem										
April	59.7		-		0.36	7.3	0.10	33.9	32.5	4.5
August	63.7		36		0.21	5.3	0.16	31.4	29.6	4.2

Table 4. continued

Component	Dry matter (%)	Proportion green leaf (%)	Proportion green stem (%)	Proportion green material (%)	Nitrogen (%)	Ash (%)	Phosphorus (%)	*in vitro* determination		
								Dry matter digestibility (%)	Organic matter digestibility (%)	Metabolisable energy (ME) (MJ/kg)
- Dead material										
April	88.8				0.28	10.7	0.04	22.9	22.4	3.0
August	92.2				0.29	6.9	0.07	32.4	31.6	4.4
- Whole plant										
October	87.9				0.34	11.1	0.11	34.1	29.9	3.9
Bluegrass (1 site only)										
- Green leaf										
April	M				1.24	11.4	0.17	50.2	51.1	6.8
- Green stem										
April	53.7				0.48	6.2	0.13	37.5	36.7	5.1
- Whole plant										
August	90.7				0.33	7.7	0.08	32.2	31.7	4.4
October	74.2				0.26	11.5	0.09	30.7	27.4	3.6

Table 5. Chemical analysis of pasture samples collected at Brigalow Research Station during 1991 (Dry matter basis).

Component	Dry matter (%)	Proportion green leaf (%)	Proportion green stem (%)	Proportion green material (%)	Nitrogen (%)	Ash (%)	Phosphorus (%)	*in vitro* determination		
								Dry matter digestibility (%)	Organic matter digestibility (%)	Metabolisable energy (ME) (MJ/kg)
Brigalow Research Station										
1. *Sown grass paddock*										
Buffel grass (5 sites overall)										
- Green leaf										
August (3 sites)	69.1 (64.4-75.9)[a]	27.6 (27.3-28.1)			0.91 (0.72-1.29)	10.0 (10.0-11.2)	0.26 (0.21-0.31)	53.5 (52.3-54.8)	52.1 (50.4-53.9)	6.9 (6.8-7.1)
- Dead material										
August (3 sites)	77.6 (75.0-81.2)				0.46 (0.45-0.47)	5.6 (5.5-5.7)	0.10 (0.09-0.12)	30.1 (27.2-31.6)	28.7 (25.6-30.3)	4.0 (3.6-4.3)
- Whole plant										
April	82.6 (78.2-85.8)				0.47 (0.41-0.50)	6.5 (5.7-8.0)	0.25 (0.07-0.39)	34.5 (32.4-36.1)	33.3 (31.4-34.9)	4.6 (4.4-4.9)
August (2 sites)	87.2 (84.6-89.8)				0.57 (0.46-0.67)	8.2 (7.6-8.7)	0.10 (0.07-0.13)	38.6 (38.2-38.9)	37.5 (37.0-38.0)	5.2 (5.1-5.2)
October	91.5 (86.9-95.7)				0.53 (0.46-0.59)	7.4 (6.3-9.3)	0.10 (0.06-0.16)	30.2 (26.3-33.3)	29.4 (25.4-33.9)	4.1 (3.5-4.6)
Rhodes grass (5 sites)										
- Green leaf										
April	84.5 (1 site)	-			1.02	10.3	0.12	38.8	35.9	4.8
August	65.6 (1 site)	27.1 (1 site)			0.55	8.1	0.34	43.9	41.8	5.7
October (2 sites)	71.4 (65.8-76.9)	23.0 (19.8-26.1)			1.29 (1.12-1.46)	11.3 (10.6-11.9)	0.24 (0.20-0.28)	54.1 (53.7-54.4)	52.95 (52.4-53.5)	7.0 (7.0-7.0)

[a] *range of values shown in parenthesis*

Table 5. continued

Component	Dry matter (%)	Proportion green leaf (%)	Proportion green stem (%)	Proportion green material (%)	Nitrogen (%)	Ash (%)	Phosphorus (%)	*in vitro* determination: Dry matter digestibility (%)	*in vitro* determination: Organic matter digestibility (%)	*in vitro* determination: Metabolisable energy (ME) (MJ/kg)
- Green stem										
April	62.3 (1 site)		-		0.52	6.6	0.08	36.2	32.8	4.6
August	64.8 (1 site)		31.7 (1 site)		0.39	4.7	0.26	23.7	20.9	2.9
October (2 sites)	61.6 (59.4-63.8)		26.8 (25.5-28.0)		0.37 (0.30-0.43)	5.7 (5.5-5.9)	0.10 (0.09-0.10)	27.4 (25.5-29.3)	23.9 (21.9-25.7)	3.3 (3.0-3.6)
- Dead material										
August	90.8 (1 site)				0.39	4.7	0.07	27.9	26.8	3.8
October (2 sites)	91.2 (91.2-91.2)				0.45 (0.40-0.50)	6.9 (5.9-7.9)	0.08 (0.06-0.09)	31.0 (30.7-31.2)	30.3 (30.0-30.6)	4.2 (4.2-4.2)
- Whole plant										
April	72.4 (67.6-77.0)				0.58 (0.50-0.63)	7.1 (7.0-7.8)	0.11 (0.09-0.13)	39.5 (38.2-41.1)	37.2 (35.7-38.4)	5.1 (4.9-5.3)
August (4 sites)	80.3 (72.2-89.8)				0.53 (0.47-0.60)	5.8 (5.2-6.1)	0.09 (0.05-0.13)	38.5 (35.2-42.0)	37.4 (34.4-41.6)	5.2 (4.8-5.8)
October (3 sites)	85.5 (83.1-88.6)				0.56 (0.45-0.62)	6.0 (5.4-6.9)	0.12 (0.09-0.15)	31.9 (31.2-33.1)	30.2 (29.2-31.0)	4.2 (4.1-4.4)
2. *Sown grass-Seca stylo paddock*										
Buffel grass (3 sites overall)										
- Green leaf										
April	81.9 (1 site)	-			0.92	13.9	0.23	46.5	46.3	5.9
August (2 sites)	64.3 (61.2-67.4)	18.3 (16.5-20.0)			0.65 (0.62-0.68)	10.4 (9.0-11.7)	0.26 (0.26-0.26)	53.4 (49.2-57.5)	52.1 (47.2-56.9)	7.0 (6.4-7.5)
October	60.8 (1 site)	25.2 (1 site)			1.17	14.0	0.21	52.5	51.7	6.6
- Green stem										
April	63.9 (1 site)		-		0.38	5.8	0.16	31.3	29.6	4.1
August	61.4 (59.5-63.2)		22.5 (15.8-29.1)		0.44 (0.33-0.54)	5.8 (4.1-7.5)	0.13 (0.12-0.13)	37.0 (28.9-45.0)	35.2 (27.0-43.3)	4.9 (3.8-6.0)
October	68.0 (2 sites)		24.9 (1 site)		0.43	4.6	0.11	30.2	28.2	4.0

Table 5. continued

Component	Dry matter (%)	Proportion green leaf (%)	Proportion green stem (%)	Proportion green material (%)	Nitrogen (%)	Ash (%)	Phosphorus (%)	*in vitro* determination		
								Dry matter digestibility (%)	Organic matter digestibility (%)	Metabolisable energy (ME) (MJ/kg)
- Dead material										
August	78.3 (77.7-78.9)				0.40 (0.35-0.44)	4.3 (4.3-4.3)	0.07 (0.06-0.08)	22.7 (21.4-24.0)	21.2 (19.5-22.8)	3.0 (2.8-3.2)
October	72.4 (1 site)				0.37	4.8	0.06	24.1	23.0	3.2
- Whole plant										
April	81.3 (78.7-85.0)				0.40 (0.37-0.41)	7.3 (6.1-8.0)	0.15 (0.13-0.16)	32.0 (30.2-34.3)	30.9 (29.0-33.3)	4.3 (4.0-4.6)
August	78.7 (1 site)				0.32	4.4	0.09	22.7	21.2	3.0
October	90.2 (89.1-91.3)				0.36 (0.32-0.40)	5.9 (5.5-6.4)	0.11 (0.09-0.12)	21.9 (20.5-23.3)	20.9 (19.5-22.3)	2.9 (2.7-3.1)
Rhodes grass (2 sites overall)										
- Green leaf										
April	72.8 (1 site)	-			0.92	10.8	0.24	39.8	37.7	5.0
August	74.0 (1 site)	16.0 (1 site)			0.79	10.2	0.27	48.5	47.4	6.3
October	66.7 (63.4-69.9)	21.4 (18.4-24.3)			1.32 (1.23-1.41)	10.3 (10.2-10.3)	0.29 (0.27-0.31)	53.1 (52.8-53.3)	51.8 (51.1-52.4)	6.9 (6.8-7.0)
- Green stem										
April	61.1 (1 site)		-		0.48	6.4	0.21	38.3	35.9	5.0
August	57.1 (1 site)		23.2 (1 site)		0.34	4.7	0.23	24.9	22.1	3.1
October	61.2 (58.3-64.0)		24.1 (21.8-26.3)		0.33 (0.30-0.35)	4.9 (4.6-5.1)	0.15 (0.13-0.17)	25.8 (24.0-27.6)	22.9 (21.4-24.3)	3.2 (3.0-3.4)
- Dead material										
August	90.6 (1 site)				0.28	6.7	0.08	31.3	31.3	4.4
October	91.8 (89.6-93.9)				0.36 (0.29-0.42)	6.0 (5.9-6.1)	0.14 (0.13-0.15)	33.0 (30.3-35.6)	31.8 (28.8-34.7)	4.4 (4.0-4.8)

Table 5. continued

Component	Dry matter (%)	Proportion green leaf (%)	Proportion green stem (%)	Proportion green material (%)	Nitrogen (%)	Ash (%)	Phosphorus (%)	*in vitro* determination		
								Dry matter digestibility (%)	Organic matter digestibility (%)	Metabolisable energy (ME) (MJ/kg)
- Whole plant										
April	76.0 (74.6-77.3)				0.47 (0.45-0.49)	7.0 (6.9-7.0)	0.19 (0.17-0.20)	37.7 (37.5-37.9)	35.9 (35.9-35.9)	5.0 (5.0-5.0)
August	86.7 (1 site)				0.42	5.1	0.16	26.2	24.3	3.4
Seca stylo (4 sites overall)										
- Whole plant										
April	80.7 (76.4-84.4)				1.04 (0.97-1.18)	3.6 (3.2-4.3)	0.08 (0.05-0.10)	29.4 (25.7-34.4)	26.8 (23.4-31.1)	3.9 (3.4-4.4)
August	69.3 (62.2-75.6)				0.90 (0.78-1.03)	2.9 (2.2-3.7)	0.07 (0.06-0.09)	24.0 (22.9-26.6)	22.2 (21.0-24.2)	3.2 (3.0-3.5)
October	82.9 (74.1-89.2)				0.93 (0.82-1.18)	3.3 (2.5-4.2)	0.07 (0.05-0.08)	21.7 (14.7-30.3)	19.5 (12.7-27.8)	2.8 (1.8-4.0)

Table 6. Chemical analysis of pasture samples collected at Blackwater during 1991 (Dry matter basis).

Component	Dry matter (%)	Proportion green leaf (%)	Proportion green stem (%)	Proportion[a] green material (%)	Nitrogen (%)	Ash (%)	Phosphorus (%)	*in vitro* determination		
								Dry matter digestibility (%)	Organic matter digestibility (%)	Metabolisable energy (ME) (MJ/kg)
Blackwater (Berrigurra) - *Sown grass paddock*										
Rhodes grass (1 site only)										
- Green leaf										
April	67.1	-			1.60	11.6	0.28	56.4	54.9	7.2
August	61.0	16.2			1.56	8.0	0.23	50.7	48.6	6.7
- Green stem										
April	53.8		-		0.78	7.4	0.15	44.6	41.0	5.7
August	58.3		20.4		0.82	5.1	0.12	37.5	34.4	4.9
- Dead material										
April	79.8				0.57	8.2	0.17	43.8	41.4	5.7
August	83.9				0.53	7.4	0.11	33.3	31.8	4.4
- Whole plant										
April	61.1				1.72	8.2	0.19	46.3	43.4	5.9
October	86.8				0.83	8.4	0.12	36.0	31.8	4.3
- Seedhead										
August	84.8				1.73	5.1	0.35	47.7	45.7	6.5
Buffel grass (3 sites overall)										
- Green leaf										
April	75.9 (71.3-79.0)[b]	-			0.84 (0.68-0.99)	13.0 (8.0-15.1)	0.20 (0.15-0.25)	49.9 (47.8-52.8)	50.5 (48.8-51.5)	6.6 (6.2-7.0)
August	75.1 (68.4-84.4)	18.4 (12.0-21.6)			1.55 (0.66-2.16)	10.5 (9.1-12.1)	0.26 (0.23-0.28)	62.8 (57.2-66.1)	61.2 (55.5-64.2)	8.2 (7.5-8.6)

[a] *sorted into green material only (that is, mixed leaf/stem) as insufficient of each component to differentiate further*
[b] *range of values shown in parenthesis*

Table 6. continued

Component	Dry matter (%)	Proportion green leaf (%)	Proportion green stem (%)	Proportion[a] green material (%)	Nitrogen (%)	Ash (%)	Phosphorus (%)	*in vitro* determination		
								Dry matter digestibility (%)	Organic matter digestibility (%)	Metabolisable energy (ME) (MJ/kg)
- Green stem										
April (1 site)	62.0 (1 site)		-		0.37	7.8	0.15	40.7	39.6	5.4
August	65.8 (62.3-68.1)		40.9 (37.7-43.9)		0.40 (0.29-0.56)	4.3 (4.2-4.5)	0.12 (0.08-0.16)	31.2 (29.8-33.1)	29.7 (28.2-31.7)	4.2 (4.0-4.5)
October	76.5 (68.5-83.2)		43.6 (31.6-50.3)		0.41 (0.30-0.62)	5.4 (3.2-7.6)	0.12 (0.11-0.13)	30.8 (25.3-34.5)	29.2 (24.7-31.7)	4.1 (3.5-4.6)
- Dead material										
April	73.0 (69.1-80.4)				0.44 (0.37-0.55)	8.7 (5.6-10.5)	0.15 (0.11-0.18)	41.1 (38.6-43.0)	40.8 (39.0-41.7)	5.6 (5.2-5.9)
August	94.3 (93.3-95.0)				0.35 (0.22-0.57)	6.9 (6.0-8.0)	0.06 (0.04-0.08)	33.3 (32.3-34.7)	33.0 (32.2-34.3)	4.5 (4.4-4.8)
October	92.5 (91.2-93.4)				0.45 (0.32-0.70)	10.1 (7.6-15.0)	0.09 (0.07-0.11)	32.8 (32.2-33.2)	29.6 (23.9-33.5)	4.0 (3.0-4.6)
- Green material										
October	93.8 (90.7-95.4)			13.9 (11.8-17.0)	1.23 (0.94-1.52)	6.7 (4.4-11.2)	0.22 (0.17-0.26)	60.8 (59.7-62.5)	61.9 (61.0-63.3)	8.6 (8.1-9.1)

Table 7. Chemical analysis of pasture samples collected at Calliope during 1992 (Dry matter basis).

Component	Dry matter (%)	Proportion green leaf (%)	Proportion green stem (%)	Proportion[a] green material (%)	Nitrogen (%)	Ash (%)	Phosphorus (%)	*in vitro* determination		
								Dry matter digestibility (%)	Organic matter digestibility (%)	Metabolisable energy (ME) (MJ/kg)
Calliope (Rowanlea)										
1. Improved pasture paddock										
Rhodes grass (3 sites overall)										
- Green leaf										
August	67.4	17.6			1.10	12.3	0.36	50.7	50.3	6.6
	(62.0-71.0)[b]	(16.5-18.5)			(0.90-1.42)	(10.8-14.2)	(0.35-0.37)	(44.8-55.2)	(44.9-54.7)	(5.7-7.3)
October (2 sites)	74.2	22.8			1.30	12.3	0.40	58.2	57.6	7.6
	(65.2-83.3)	(20.3-25.2)			(1.20-1.30)	(11.8-12.7)	(0.37-0.42)	(56.6-59.8)	(56.0-59.1)	(7.3-7.8)
December[c]	58.3	-			1.21	11.6	0.35	53.7	52.7	7.0
(3 sites)	(49.1-65.0)				(1.17-1.23)	(10.9-12.1)	(0.3-0.4)	(50.6-56.9)	(50.2-55.5)	(6.6-7.4)
- Green stem										
August	56.2		28.5		0.31	4.6	0.31	28.5	26.2	3.7
	(54.1-58.0)		(24.8-31.9)		(0.26-0.36)	(4.3-5.0)	(0.26-0.37)	(25.1-34.7)	(22.5-32.7)	(3.2-4.6)
October (2 sites)	63.4		33.4		0.26	5.8	0.32	22.8	19.6	2.8
	(60.9-65.9)		(26.9-39.8)		(0.21-0.30)	(4.1-7.5)	(0.26-0.37)	(17.5-28.0)	(14.3-24.8)	(2.1-3.5)
December	64.9		32.7		0.24	5.5	0.27	20.3	17.1	2.4
	(1 site)		(1 site)							
- Green material (mixed leaf/stem)										
October	81.7			14.1	0.89	10.7	0.31	51.0	48.6	6.5
	(1 site)			(1 site)						
- Dead material										
August	92.0				0.33	7.8	0.17	25.4	23.9	3.3
	(90.7-93.7)				(0.29-0.36)	(7.3-8.8)	(0.16-0.17)	(22.2-30.1)	(20.3-29.3)	(2.8-4.0)
October (3 sites)	90.2				0.27	7.6	0.19	19.9	18.0	2.5
	(85.3-94.4)				(0.22-0.33)	(5.2-11.6)	(0.12-0.32)	(16.1-24.5)	(13.4-22.6)	(1.9-3.0)
December	88.0				0.26	5.6	0.14	14.4	11.5	1.6
(3 sites)	(84.4-90.5)				(0.23-0.30)	(5.2-6.5)	(0.12-0.18)	(12.2-16.2)	(8.0-13.9)	(1.1-1.9)

[a] *sorted into green material only (that is, mixed leaf/stem) as insufficient of each component to differentiate further*
[b] *range of values in parenthesis*
[c] *no proportions have been calculated for December as all new growth was from the basal region*

Table 7. continued

Component	Dry matter (%)	Proportion green leaf (%)	Proportion green stem (%)	Proportion[a] green material (%)	Nitrogen (%)	Ash (%)	Phosphorus (%)	*in vitro* determination		
								Dry matter digestibility (%)	Organic matter digestibility (%)	Metabolisable energy (ME) (MJ/kg)
Speargrass (2 sites overall)										
- Green leaf										
December (2 sites)	80.6 (77.6-83.6)				1.1 (1.1-1.1)	12.3 (11.5-13.0)	0.20 (0.18-0.21)	37.3 (34.6-39.9)	37.9 (35.7-40.0)	5.0 (4.7-5.2)
- Green material October (2 sites)	89.4 (83.7-95.1)			25.8 (25.2-26.3)	0.80 (0.58-1.02)	12.3 (11.6-12.9)	0.21 (0.19-0.22)	47.3 (34.4-60.2)	46.7 (33.9-59.5)	6.1 (4.4-7.8)
- Dead material										
October	93.4 (92.6-94.2)				0.23 (0.21-0.24)	10.4 (9.5-11.3)	0.08 (0.06-0.10)	21.6 (19.6-23.5)	21.0 (18.5-23.5)	2.8 (2.5-3.1)
December (2 sites)	90.4 (89.7-91.1)				0.25 (0.21-0.29)	11.8 (9.0-14.6)	0.09 (0.05-0.13)	18.0 (15.3-20.6)	17.5 (14.8-20.2)	2.3 (1.9-2.7)
- Whole plant August	82.0 (77.7-86.4)				0.35 (0.29-0.40)	11.0 (10.8-11.2)	0.10 (0.07-0.12)	29.5 (26.1-32.9)	29.9 (26.7-33.1)	4.0 (3.5-4.4)
Siratro (3 sites overall)										
- Whole plant August	64.8 (1 site)				1.39	6.4	0.15	43.2	40.1	5.6
October	48.4 (46.2-50.2)				2.28 (2.01-2.66)	8.1 (8.0-8.2)	0.20 (0.19-0.20)	56.4 (51.6-60.4)	53.8 (49.1-57.9)	7.4 (6.8-8.0)
December (3 sites)	42.6 (37.1-47.6)				2.67 (2.28-2.97)	8.4 (8.2-8.7)	0.21 (0.18-0.23)	57.2 (50.6-62.6)	54.9 (48.3-59.7)	7.5 (6.6-8.2)

Table 7. continued

Component	Dry matter (%)	Proportion green leaf (%)	Proportion green stem (%)	Proportion[a] green material (%)	Nitrogen (%)	Ash (%)	Phosphorus (%)	*in vitro* determination		
								Dry matter digestibility (%)	Organic matter digestibility (%)	Metabolisable energy (ME) (MJ/kg)
Wyn cassia										
- Whole plant										
August	69.1 (1 site)				1.09	4.2	0.15	45.9	43.9	6.3
October	64.0 (1 site)				1.19	5.5	0.17	43.9	41.8	5.9
December	56.6 (1 site)				2.12	8.1	0.22	57.6	54.3	7.4
Seca stylo										
October	67.7 (1 site)				0.82	4.8	0.09	22.7	20.3	2.9
December	53.8 (1 site)				2.10	8.1	0.18	54.7	51.1	7.0
2. *Native pasture paddock*										
Speargrass (1 site only)										
- Green leaf										
August	84.4 (1 site)	22.8 (1 site)			0.78	11.5	0.18	31.2	31.0	4.1
- Green leaf										
October (burnt)	67.6 (1 site)	100 (1 site)			1.25	9.4	0.26	51.3	50.6	6.9
December (burnt)	63.4 (1 site)				1.10	10.1	0.25	44.7	43.3	5.8
- Green stem										
August	64.0 (1 site)		37.6 (1 site)		0.20	6.0	0.22	25.3	23.9	3.3
- Dead material										
August	90.8 (1 site)				0.39	9.2	0.10	29.6	29.3	4.0

Table 7. continued

Component	Dry matter (%)	Proportion green leaf (%)	Proportion green stem (%)	Proportion[a] green material (%)	Nitrogen (%)	Ash (%)	Phosphorus (%)	*in vitro* determination		
								Dry matter digestibility (%)	Organic matter digestibility (%)	Metabolisable energy (ME) (MJ/kg)
Blue grass (1 site only)[d]										
- Green leaf										
August	76.5 (1 site)	24.5 (1 site)			1.30	10.2	0.29	55.6	55.7	7.5
October (burnt)	74.4 (1 site)	100.0 (1 site)			1.14	14.3	0.16	51.7	53.6	6.8
October (unburnt)	94.2 (1 site)	24.8 (1 site)			1.50	11.5	0.28	45.7	49.5	6.5
- Green stem										
August	65.3 (1 site)		32.2 (1 site)		0.29	7.5	0.26	35.3	34.3	4.7
October	80.8 (1 site)		37.6 (1 site)		0.14	10.2	0.07	21.1	20.0	2.7
- Green material										
December (unburnt)	76.6 (1 site)			45.9 (1 site)	0.91	10.3	0.16	39.4	38.1	5.1
- Dead Material										
August	90.8 (1 site)				0.42	8.4	0.10	28.1	27.5	3.7
October	94.6 (1 site)				0.31	11.6	0.06	27.2	27.4	3.6
December (unburnt)	90.4 (1 site)				0.28	10.1	0.07	20.1	19.9	2.6
- Whole plant										
December (burnt)	49.1 (1 site)				1.68	10.7	0.24	58.3	57.7	7.7

[d] Bluegrass species in burnt area differs from blue grass species in unburnt area.

Table 8. Chemical analysis of pasture samples collected at Brigalow Research Station during 1992 (Dry matter basis).

Component	Dry matter (%)	Proportion green leaf (%)	Proportion green stem (%)	Proportion green material (%)	Nitrogen (%)	Ash (%)	Phosphorus (%)	*in vitro* determination: Dry matter digestibility (%)	*in vitro* determination: Organic matter digestibility (%)	*in vitro* determination: Metabolisable energy (ME) (MJ/kg)
Brigalow Research Station										
1. Sown grass paddock										
Buffel grass (5 sites overall)										
- Green leaf										
August	76.7 (1 site)	20.9 (1 site)			0.81	11.3	0.29	51.7	51.6	6.8
October (4 sites)	71.8 (68.7-77.6)[a]	24.4 (22.5-27.2)			1.10 (1.04-1.14)	11.5 (11.1-12.4)	0.25 (0.17-0.29)	58.1 (56.6-58.8)	58.0 (55.8-59.5)	7.7 (7.4-7.8)
December (4 sites)[b]	48.4 (42.8-58.1)	26.6 (24.3-29.9)			1.60 (1.37-1.94)	11.1 (10.7-11.8)	0.27 (0.23-0.30)	60.6 (54.9-64.4)	59.2 (53.6-63.5)	7.9 (7.2-8.4)
- Green stem										
August	68.8 (1 site)		40.7 (1 site)		0.33	5.1	0.21	37.9	36.4	5.1
October (4 sites)	68.4 (66.5-72.3)		39.1 (35.2-43.3)		0.32 (0.26-0.41)	4.2 (4.0-4.5)	0.16 (0.09-0.23)	34.2 (31.6-36.0)	33.4 (30.7-35.4)	4.8 (4.4-5.1)
December (4 sites)	61.7 (59.0-65.5)		34.1 (31.6-36.4)		0.42 (0.36-0.51)	4.8 (4.1-5.5)	0.14 (0.09-0.19)	31.9 (25.5-34.6)	30.2 (23.8-33.1)	4.3 (3.3-4.7)
- Dead material										
August	89.9 (1 site)				0.36	10.9	0.17	38.5	38.9	5.2
October (4 sites)	91.4 (90.1-92.2)				0.33 (0.31-0.36)	7.5 (7.3-7.8)	0.06 (0.04-0.09)	29.8 (22.7-37.9)	29.4 (21.1-39.1)	4.1 (2.9-5.5)

[a] *range of values shown in parenthesis*
[b] *All December dry matter (%) figures may be inaccurate due to samples being collected in the rain.*

Component	Dry matter (%)	Proportion green leaf (%)	Proportion green stem (%)	Proportion green material (%)	Nitrogen (%)	Ash (%)	Phosphorus (%)	*in vitro* determination		
								Dry matter digestibility (%)	Organic matter digestibility (%)	Metabolisable energy (ME) (MJ/kg)
- December (4 sites)	71.8 (54.6-83.7)				0.32 (0.30-0.35)	6.2 (5.4-7.0)	0.06 (0.05-0.07)	21.5 (16.9-28.9)	20.0 (15.0-28.2)	2.8 (2.1-4.0)
- Whole plant										
August (4 sites)	78.4 (76.3-82.4)				0.42 (0.37-0.47)	7.9 (6.7-8.9)	0.13 (0.08-0.16)	45.2 (41.1-52.5)	44.7 (40.9-52.4)	6.2 (5.6-7.3)
October	72.5 (1 site)				0.50	6.7	0.16	40.1	39.4	5.5
Rhodes grass (5 sites)										
- Green leaf										
August (3 sites)	57.5 (50.0-67.8)	38.8 (30.8-45.5)			0.95 (0.86-1.09)	11.9 (11.2-12.3)	0.30 (0.25-0.33)	45.1 (40.9-52.4)	43.8 (40.1-51.1)	5.7 (5.2-6.8)
October (3 sites)	53.1 (46.5-59.2)	37.1 (36.2-39.0)			0.99 (0.84-1.09)	12.0 (11.3-13.4)	0.25 (0.21-0.28)	45.4 (39.9-48.3)	44.0 (37.1-48.0)	5.8 (4.8-6.4)
December (3 sites)	41.1 (39.6-42.7)	26.3 (25.6-26.8)			1.29 (1.22-1.34)	8.4 (8.0-8.8)	0.19 (0.16-0.22)	52.1 (48.6-54.1)	50.0 (46.5-52.2)	6.9 (6.4-7.2)
- Green stem										
August (3 sites)	63.5 (56.8-70.8)		26.3 (24.3-28.4)		0.37 (0.31-0.43)	5.7 (5.4-6.2)	0.21 (0.17-0.24)	34.0 (31.9-37.9)	30.9 (28.8-34.6)	4.3 (4.0-4.8)
October (3 sites)	60.1 (58.8-62.5)		22.8 (21.6-25.0)		0.30 (0.27-0.32)	5.2 (5.2-5.2)	0.16 (0.15-0.17)	27.9 (23.0-33.4)	25.0 (19.5-30.2)	3.6 (2.8-4.3)
December (3 sites)	41.4 (38.7-45.9)		26.5 (24.8-28.7)		0.79 (0.76-0.84)	7.8 (7.2-8.2)	0.22 (0.19-0.24)	53.6 (52.6-54.9)	50.4 (49.5-51.7)	6.9 (6.8-7.1)
- Dead material										
August (3 sites)	91.7 (90.5-93.2)				0.41 (0.34-0.45)	9.2 (8.3-10.7)	0.11 (0.10-0.13)	25.9 (24.8-27.8)	25.1 (24.2-26.6)	3.4 (3.3-3.6)
October (3 sites)	91.3 (90.2-92.8)				0.37 (0.33-0.42)	8.3 (6.8-9.7)	0.09 (0.07-0.10)	26.9 (24.3-28.6)	26.5 (24.3-27.7)	3.7 (3.3-3.9)
December (3 sites)	73.7 (71.1-77.2)				0.32 (0.29-0.36)	7.0 (5.5-7.7)	0.06 (0.05-0.07)	24.2 (23.9-24.7)	23.3 (22.8-23.9)	3.2 (3.1-3.3)
- Whole plant										
August	70.8 (1 site)				0.71	9.1	0.09	39.8	37.6	5.1

Component	Dry matter (%)	Proportion green leaf (%)	Proportion green stem (%)	Proportion green material (%)	Nitrogen (%)	Ash (%)	Phosphorus (%)	*in vitro* determination		
								Dry matter digestibility (%)	Organic matter digestibility (%)	Metabolisable energy (ME) (MJ/kg)
2. *Sown grass-Seca stylo paddock*										
Buffel grass (3 sites overall)										
- Green leaf										
August (2 sites)	75.9 (71.1-80.7)	13.3 (12.7-14.0)			0.89 (0.83-0.94)	11.0 (10.1-11.8)	0.23 (0.17-0.28)	57.4 (52.5-62.3)	57.3 (52.6-62.0)	7.7 (6.9-8.4)
October (3 sites)	76.5 (75.7-76.9)	17.9 (16.6-19.4)			1.20 (1.14-1.26)	12.7 (11.7-13.2)	0.34 (0.31-0.38)	59.3 (58.3-60.1)	58.8 (58.2-59.8)	7.7 (7.6-7.7)
December (3 sites)	50.5 (44.2-59.3)	28.6 (27.0-31.6)			1.40 (1.14-1.82)	12.8 (10.2-16.4)	0.33 (0.27-0.40)	58.0 (56.5-60.8)	57.0 (54.5-60.3)	7.5 (7.1-8.0)
- Green stem										
August (2 sites)	64.0 (64.0-64.1)		29.1 (28.0-30.2)		0.29 (0.28-0.30)	4.3 (4.0-4.6)	0.18 (0.14-0.21)	36.5 (36.3-36.7)	35.0 (34.7-35.3)	5.0 (5.0-5.0)
October (3 sites)	70.3 (68.6-71.4)		28.0 (26.2-29.6)		0.32 (0.28-0.35)	4.7 (4.2-5.4)	0.19 (0.15-0.22)	34.3 (31.3-38.6)	32.2 (29.7-35.6)	4.5 (4.2-5.0)
December (3 sites)	59.6 (57.9-61.2)		33.9 (32.6-35.6)		0.34 (0.29-0.42)	5.5 (4.1-7.2)	0.19 (0.16-0.24)	28.9 (25.3-31.1)	27.2 (23.4-29.8)	3.8 (3.2-4.2)
- Dead material										
August (2 sites)	91.5 (91.4-91.6)				0.32 (0.29-0.35)	11.3 (9.9-12.6)	0.09 (0.07-0.10)	33.6 (32.4-34.8)	33.8 (32.0-35.5)	4.5 (4.3-4.6)
October (3 sites)	92.3 (91.5-93.1)				0.31 (0.26-0.38)	9.1 (7.5-10.2)	0.08 (0.06-0.10)	27.2 (24.6-31.6)	29.3 (23.6-34.1)	3.5 (3.2-4.1)
December (3 sites)	66.1 (60.5-70.4)				0.33 (0.27-0.44)	7.8 (6.4-9.9)	0.08 (0.06-0.10)	21.2 (20.8-21.6)	19.2 (18.3-20.0)	2.6 (2.4-2.8)
- Whole plant										
August	84.9 (1 site)				0.46	7.9	0.17	40.0	39.3	5.4

Component	Dry matter (%)	Proportion green leaf (%)	Proportion green stem (%)	Proportion green material (%)	Nitrogen (%)	Ash (%)	Phosphorus (%)	*in vitro* determination		
								Dry matter digestibility (%)	Organic matter digestibility (%)	Metabolisable energy (ME) (MJ/kg)
Rhodes grass (2 sites overall)										
- Green leaf										
August	62.2 (61.7-62.7)	22.3 (21.5-23.2)			0.82 (0.79-0.85)	10.5 (10.2-10.7)	0.29 (0.28-0.30)	40.7 (38.2-43.2)	39.0 (36.3-41.6)	5.2 (4.8-5.6)
October	55.1 (54.6-55.7)	26.1 (24.3-27.8)			1.09 (1.07-1.11)	11.1 (11.0-11.1)	0.31 (0.31-0.31)	48.0 (46.8-49.1)	46.2 (44.5-47.8)	6.2 (5.9-6.4)
December (2 sites)	42.9 (41.2-44.7)	26.1 (25.7-26.5)			1.13 (1.00-1.25)	8.0 (7.8-8.2)	0.27 (0.23-0.30)	48.5 (45.9-51.0)	45.7 (43.4-47.9)	6.3 (6.0-6.6)
- Green stem										
August	61.8 (59.8-63.8)		18.0 (17.4-18.6)		0.35 (0.31-0.38)	5.3 (4.9-5.6)	0.27 (0.23-0.30)	29.9 (28.1-31.7)	26.7 (24.9-28.4)	3.8 (3.5-4.0)
October	64.5 (61.4-67.5)		15.6 (12.2-19.0)		0.34 (0.30-0.37)	5.6 (5.0-6.1)	0.24 (0.22-0.26)	25.9 (23.4-28.4)	22.3 (20.5-24.1)	3.2 (2.9-3.4)
December (2 sites)	43.7 (42.8-44.5)		26.6 (25.6-27.6)		0.80 (0.73-0.86)	7.6 (6.9-8.3)	0.27 (0.23-0.30)	41.3 (37.4-45.2)	37.1 (33.2-40.9)	5.1 (4.6-5.6)
- Dead material										
August	93.6 (92.4-94.9)				0.42 (0.41-0.43)	6.8 (6.1-7.5)	0.14 (0.12-0.15)	25.3 (22.3-28.2)	24.2 (21.2-27.1)	3.4 (2.9-3.8)
October	93.3 (92.5-94.0)				0.35 (0.34-0.36)	6.9 (6.6-7.1)	0.10 (0.10-0.10)	23.9 (22.1-25.7)	23.0 (20.9-25.1)	3.2 (2.9-3.5)
December (2 sites)	78.0 (71.4-84.7)				0.34 (0.34-0.34)	11.8 (6.5-17.0)	0.08 (0.07-0.09)	21.1 (20.4-21.7)	19.9 (19.2-20.5)	2.7 (2.6-2.8)
Seca stylo (5 sites overall)										
- Whole plant										
August	74.9 (65.2-80.1)				1.20 (1.12-1.30)	4.4 (3.9-4.9)	0.09 (0.08-0.10)	34.6 (30.1-39.0)	31.8 (27.4-36.2)	4.5 (3.9-5.1)
October	70.4 (62.2-82.3)				1.26 (1.14-1.50)	4.7 (3.5-5.9)	0.12 (0.09-0.14)	34.3 (25.7-43.2)	31.6 (23.2-40.2)	4.5 (3.3-5.6)
December (5 sites)	52.2 (43.2-62.5)				1.34 (1.26-1.46)	8.4 (4.8-15.8)	0.12 (0.10-0.15)	37.9 (34.6-41.7)	34.8 (31.8-37.9)	4.9 (4.4-5.1)

Table 9. Chemical analysis of pasture samples collected at Blackwater during 1992 (Dry matter basis).

Component	Dry matter (%)	Proportion green leaf (%)	Proportion green stem (%)	Proportion[a] green material (%)	Nitrogen (%)	Ash (%)	Phosphorus (%)	*in vitro* determination: Dry matter digestibility (%)	*in vitro* determination: Organic matter digestibility (%)	*in vitro* determination: Metabolisable energy (ME) (MJ/kg)
Blackwater (Berrigurra) - *Sown grass paddock*										
Rhodes grass (1 site only)										
- Green leaf										
August	68.4	9.4			2.12	9.5	0.27	58.5	62.6	8.5
	(1 site)	(1 site)								
- Green stem										
August	56.9		14.9		0.90	6.5	0.13	35.3	31.8	4.5
	(1 site)		(1 site)							
- Dead material										
August	89.3				0.47	5.4	0.06	25.1	23.8	3.4
	(1 site)									
- Whole plant										
October	89.4				0.55	5.0	0.09	28.0	26.1	3.7
	(1 site)									
Buffel grass (3 sites overall)										
- Green leaf										
August	76.1	20.1			2.17	10.5	0.41	67.4	65.5	8.8
	(72.2-78.4)[b]	(17.2-22.7)			(1.83-2.71)	(9.6-11.4)	(0.35-0.48)	(64.0-70.9)	(61.8-69.2)	(8.4-9.2)
December (3 sites)	53.3	22.4			1.69	11.7	0.28	69.1	67.4	8.9
	(49.8-58.7)	(19.1-24.4)			(1.34-2.21)	(10.8-12.3)	(0.23-0.33)	(64.5-71.7)	(62.2-70.6)	(8.2-9.5)
- Green stem										
August	73.0		33.4		0.40	4.3	0.15	35.5	34.3	4.9
	(69.6-75.3)		(31.0-35.5)		(0.29-0.59)	(3.8-5.2)	(0.11-0.18)	(31.6-40.3)	(30.8-39.2)	(4.5-5.5)
December (3 sites)	71.4		30.2		0.58	5.5	0.13	37.3	36.0	5.1
	(69.6-73.8)		(24.0-33.7)		(0.35-0.83)	(4.7-6.5)	(0.12-0.13)	(31.4-44.0)	(29.8-42.7)	(4.2-6.0)

[a] *sorted into green material only (that is, mixed leaf/stem) as insufficient of each component to differentiate further*
[b] *range of values shown in brackets*

Table 9. continued

Component	Dry matter (%)	Proportion green leaf (%)	Proportion green stem (%)	Proportion[a] green material (%)	Nitrogen (%)	Ash (%)	Phosphorus (%)	*in vitro* determination: Dry matter digestibility (%)	*in vitro* determination: Organic matter digestibility (%)	*in vitro* determination: Metabolisable energy (ME) (MJ/kg)
- Green material										
October (2 sites)	82.1			50.1	0.51	5.2	0.14	39.0	38.1	5.4
	(80.5-83.7)			(49.6-50.5)	(0.45-0.56)	(4.9-5.4)	(0.11-0.17)	(38.2-39.7)	(37.5-38.6)	(5.3-5.5)
- Dead material										
August	90.4				0.37	6.6	0.08	33.5	33.0	4.6
	(89.7-90.8)				(0.29-0.48)	(6.2-7.1)	(0.05-0.11)	(32.1-35.1)	(31.1-35.3)	(4.3-5.0)
October (2 sites)	95.1				0.31	6.0	0.08	32.8	32.5	4.6
	(95.0-95.2)				(0.27-0.35)	(5.9-6.1)	(0.07-0.08)	(30.5-35.1)	(30.3-34.6)	(4.3-4.9)
December (3 sites)	89.5				0.37	7.1	0.07	26.3	26.2	3.6
	(88.5-90.1)				(0.27-0.54)	(6.7-7.5)	(0.05-0.08)	(24.3-28.3)	(24.2-27.4)	(3.3-3.8)
- Whole plant										
October	89.4				0.53	6.7	0.11	24.0	23.1	3.2
	(1 site)									

Table 10. Chemical analysis of pasture samples collected at Calliope during 1993 (Dry matter basis).

Component	Dry matter (%)	Proportion green leaf (%)	Proportion green stem (%)	Proportion green material (%)	Nitrogen (%)	Ash (%)	Phosphorus (%)	*in vitro* determination: Dry matter digestibility (%)	*in vitro* determination: Organic matter digestibility (%)	*in vitro* determination: Metabolisable energy (ME) (MJ/kg)
Calliope (Rowanlea)										
1. Improved pasture paddock										
Rhodes grass (3 sites overall)										
- Green leaf June	56.3 (53.1-61.9)[a]	29.3 (28.2-31.5)			0.76 (0.72-0.82)	10.6 (10.3-10.8)	0.28 (0.27-0.29)	41.0 (36.7-44.9)	39.3 (35.5-42.9)	5.2 (4.7-5.7)
- Green stem June	46.0 (45.4-46.8)		24.0 (23.1-24.4)		0.45 (0.35-0.54)	6.2 (5.2-7.0)	0.23 (0.22-0.24)	37.1 (34.9-39.6)	34.2 (32.6-36.1)	4.8 (4.6-5.0)
- Dead material June	89.6 (88.5-91.0)				0.28 (0.24-0.32)	8.9 (7.4-10.6)	0.17 (0.13-0.22)	25.3 (24.3-26.1)	25.1 (23.6-25.8)	3.4 (3.1-3.5)
Speargrass (2 sites overall)										
- Green leaf June	87.2 (87.1-87.3)	34.7 (34.6-34.8)			0.62 (0.59-0.64)	8.6 (6.9-10.3)	0.11 (0.09-0.13)	31.3 (27.5-35.0)	31.3 (26.8-35.8)	4.3 (3.6-5.0)
- Green stem June	73.1 (71.7-74.5)		29.1 (28.7-29.5)		0.31 (0.30-0.32)	7.1 (6.7-7.5)	0.10 (0.10-0.10)	31.0 (29.7-32.2)	29.4 (27.1-31.6)	4.1 (3.7-4.4)
- Dead material June	91.1 (90.6-91.5)				0.32 (0.32-0.32)	10.7 (9.4-11.9)	0.06 (0.05-0.06)	27.4 (23.5-31.3)	28.5 (24.1-32.8)	3.8 (3.1-4.4)
Siratro (3 sites overall)										
- Whole plant June	44.2 (38.8-52.2)				1.62 (1.38-1.79)	6.8 (6.0-7.3)	0.16 (0.13-0.20)	49.5 (49.0-50.3)	46.8 (46.0-48.3)	6.5 (6.4-6.8)
Wyn cassia										
- Whole plant June (1 site)	57.2				1.20	4.9	0.19	48.9	47.0	6.7
Seca stylo										
- Whole plant June (1 site)	66.8				1.50	6.9	0.11	42.4	39.5	5.5

[a] *range of values shown in parenthesis*

Table 11. Acid detergent fibre content and metabolisable energy of Seca stylo samples from two locations in Central Queensland.

Location/site		Acid detergent fibre (%)				Metabolisable energy (MJ/kg DM)[1]			
		Aug. 1992	Oct. 1992	Dec. 1992	Jun. 1993	Aug. 1992	Oct. 1992	Dec. 1992	Jun. 1993
Brigalow (Sown grass-Seca stylo paddock)	Site 1	58.7	54.0	59.6	-	5.8	6.7	6.1	-
	Site 2	60.2	62.0	55.8	-	5.5	5.2	6.3	-
	Site 3	55.7	56.6	56.5	-	6.3	6.1	6.1	-
	Site 4	62.3	63.5	60.5	-	5.2	5.0	5.5	-
	Site 5	59.3	55.7	50.7	-	5.5	6.3	7.2	-
Calliope (Improved pasture-sown pasture paddock)	Site 2	-	62.0	45.8	50.1	-	4.9	8.5	6.2

[1] Predicted using the equation ME = 13.5-0.15 ADF -0.14 Crude protein (Equation 67, Technical Bulletin 33, 1975).

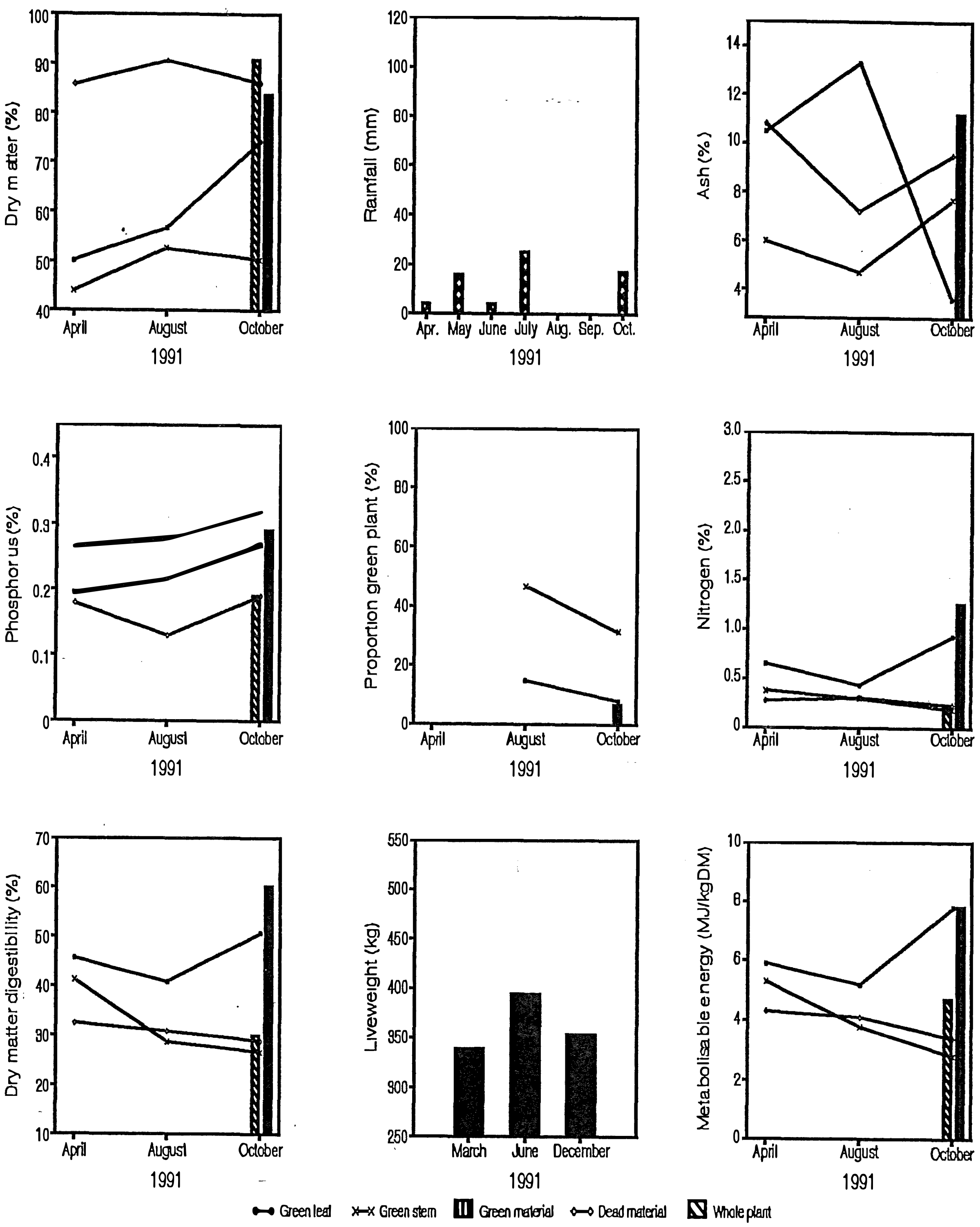

Fig. 1 Biochemical analysis of rhodes grass plant components over time from an improved pasture paddock and corresponding steer liveweights at a Calliope site during 1991

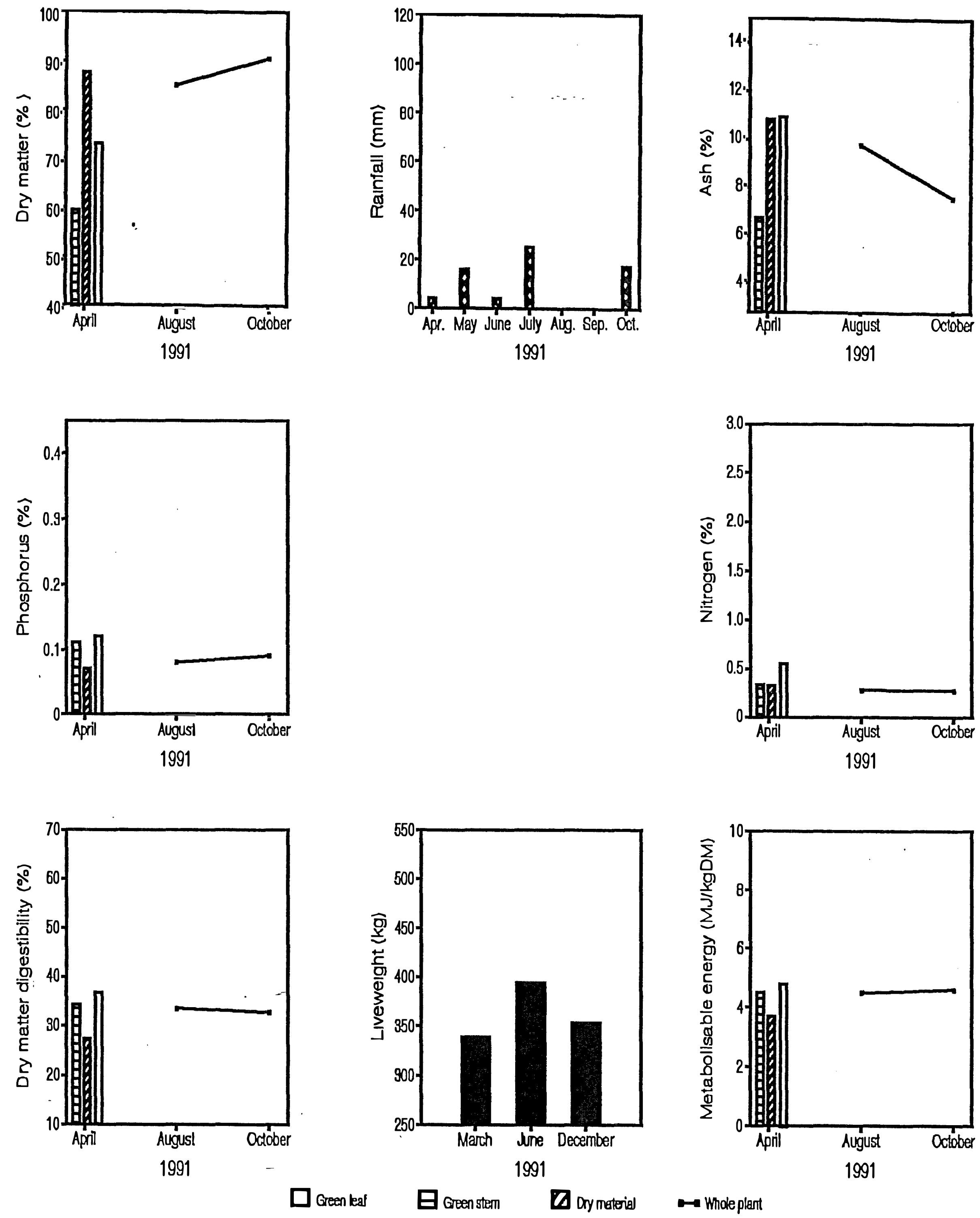

Fig. 2 Biochemical analysis of speargrass plant components over time from an improved pasture paddock and corresponding steer liveweights at a Calliope site during 1991

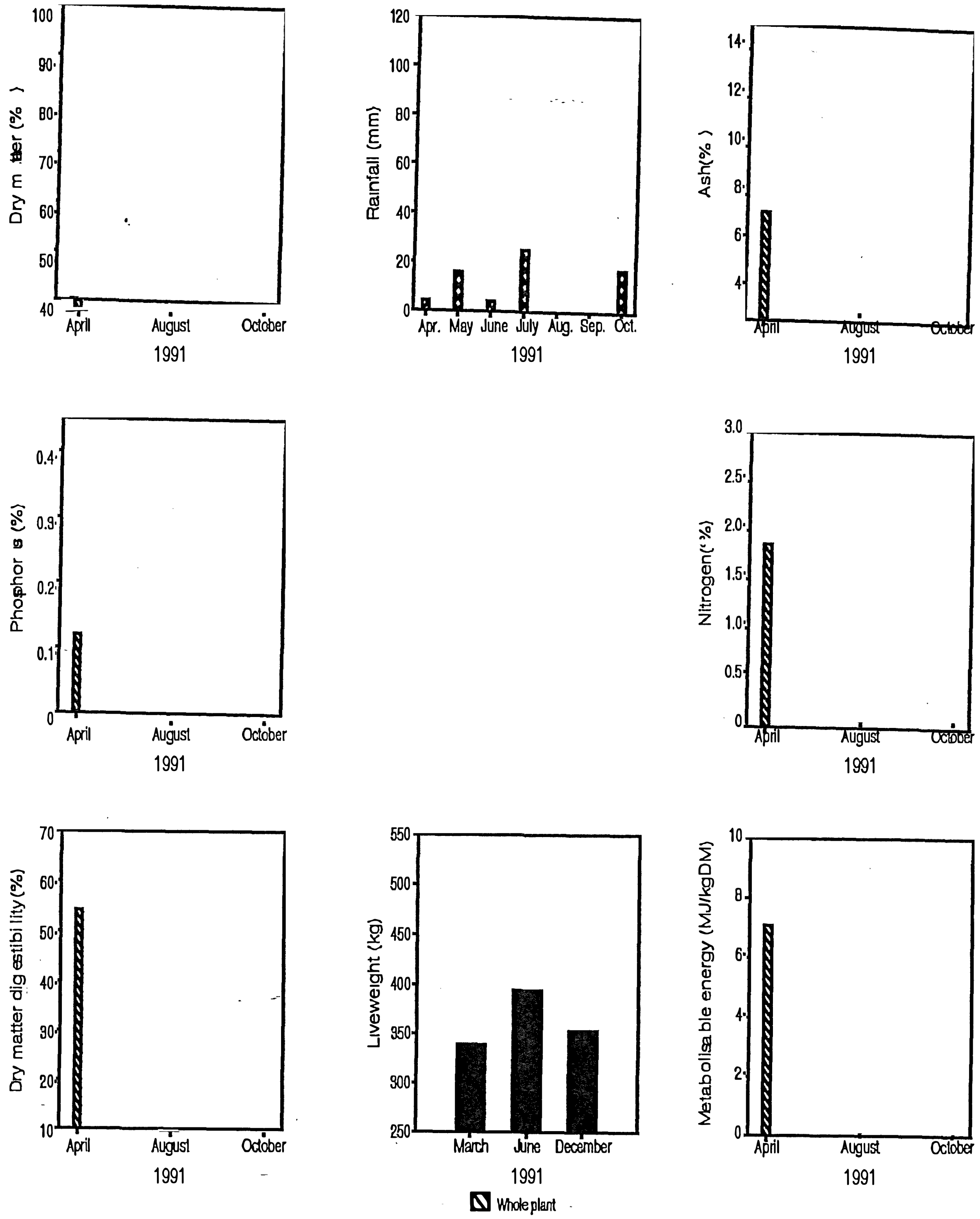

Fig. 3 Biochemical analysis of Siratro plants over time from an improved pasture paddock and corresponding steer liveweights at a Calliope site during 1991

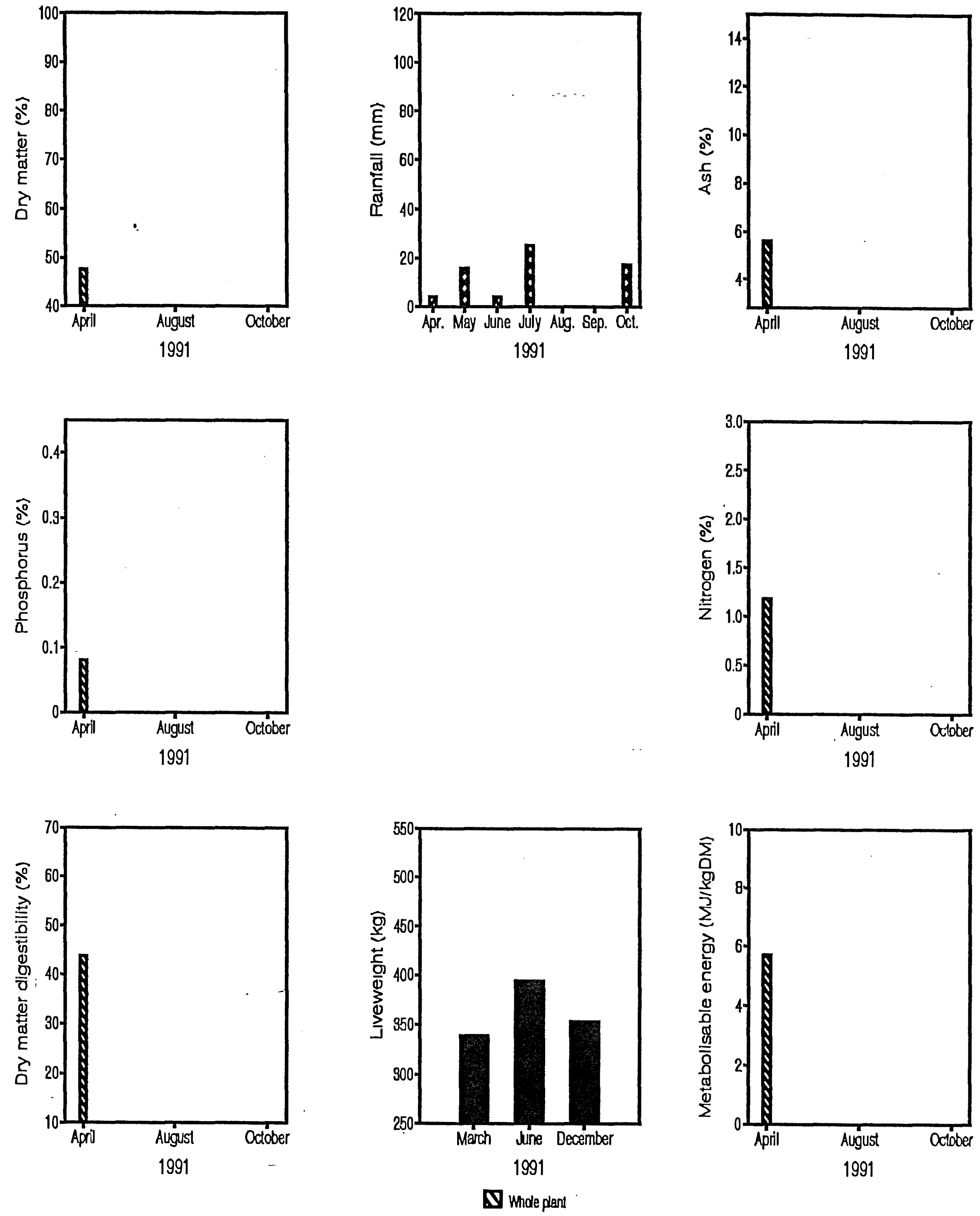

Fig. 4 Biochemical analysis of Wyn cassia plants over time from an improved pasture paddock and corresponding steer liveweights at a Calliope site during 1991

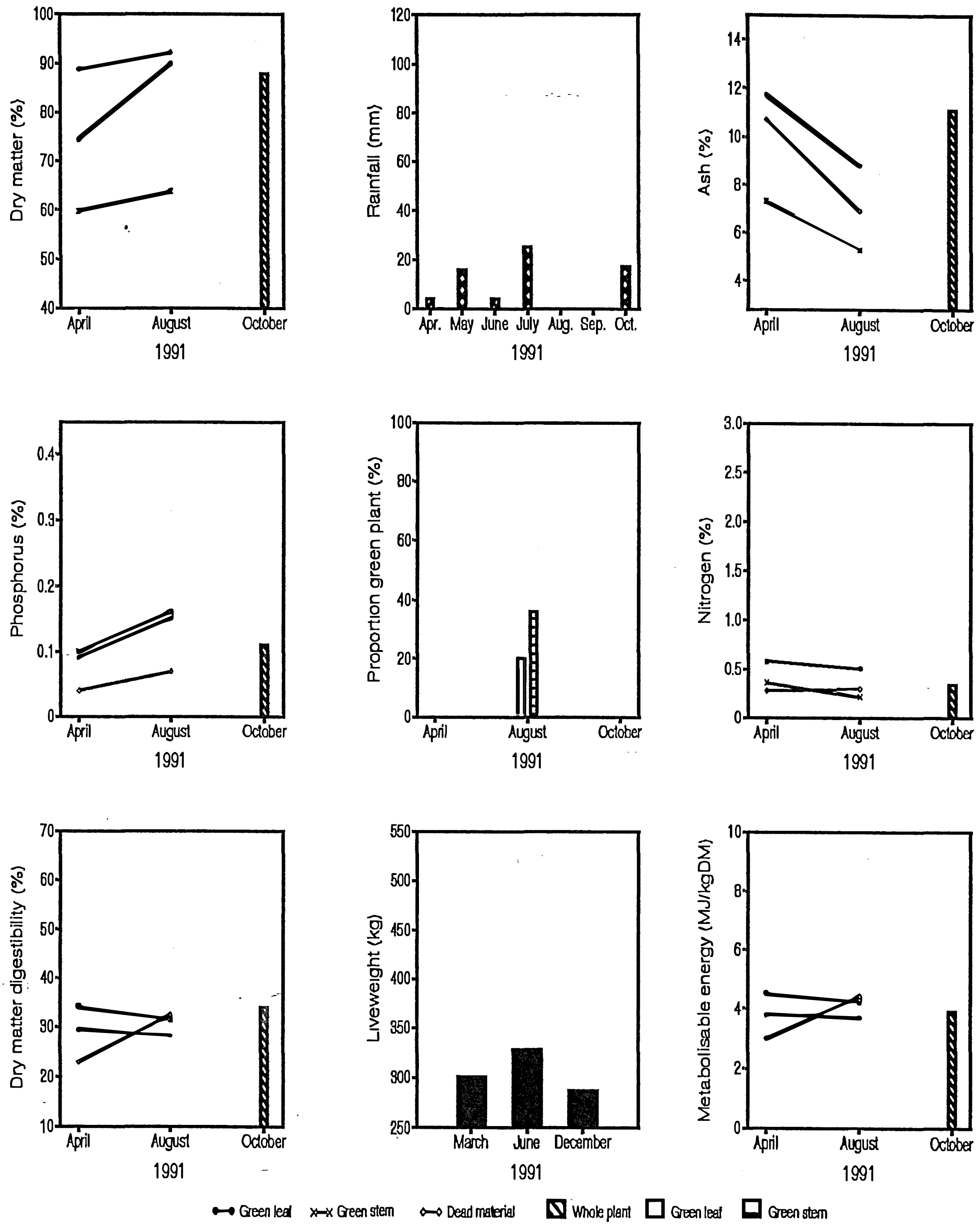

Fig. 5 Biochemical analysis of speargrass plant components over time from a native pasture paddock and corresponding steer liveweights at a Calliope site during 1991

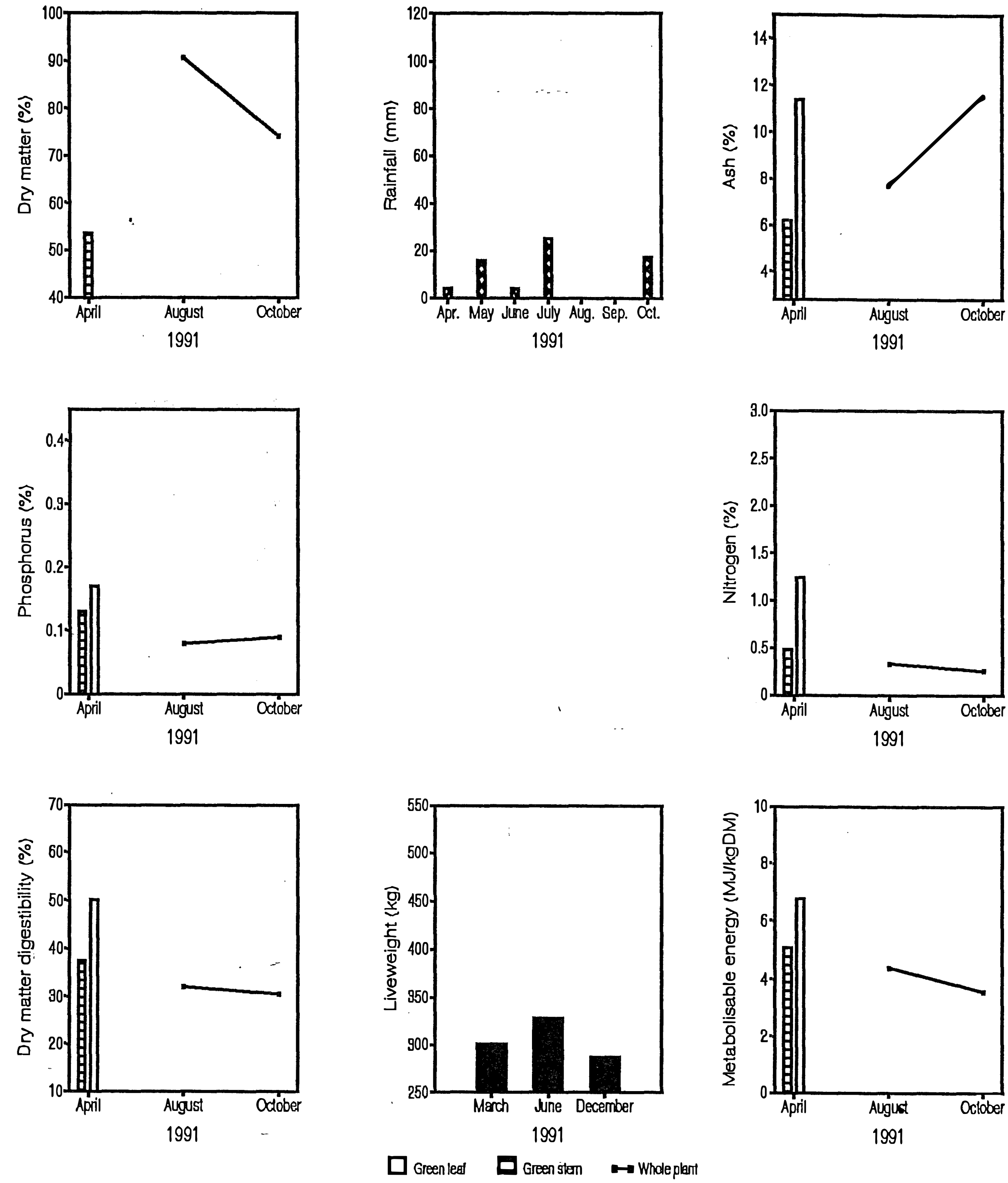

Fig. 6 Biochemical analysis of bluegrass plant components over time from a native pasture paddock and corresponding steer liveweights at a Calliope site during 1991

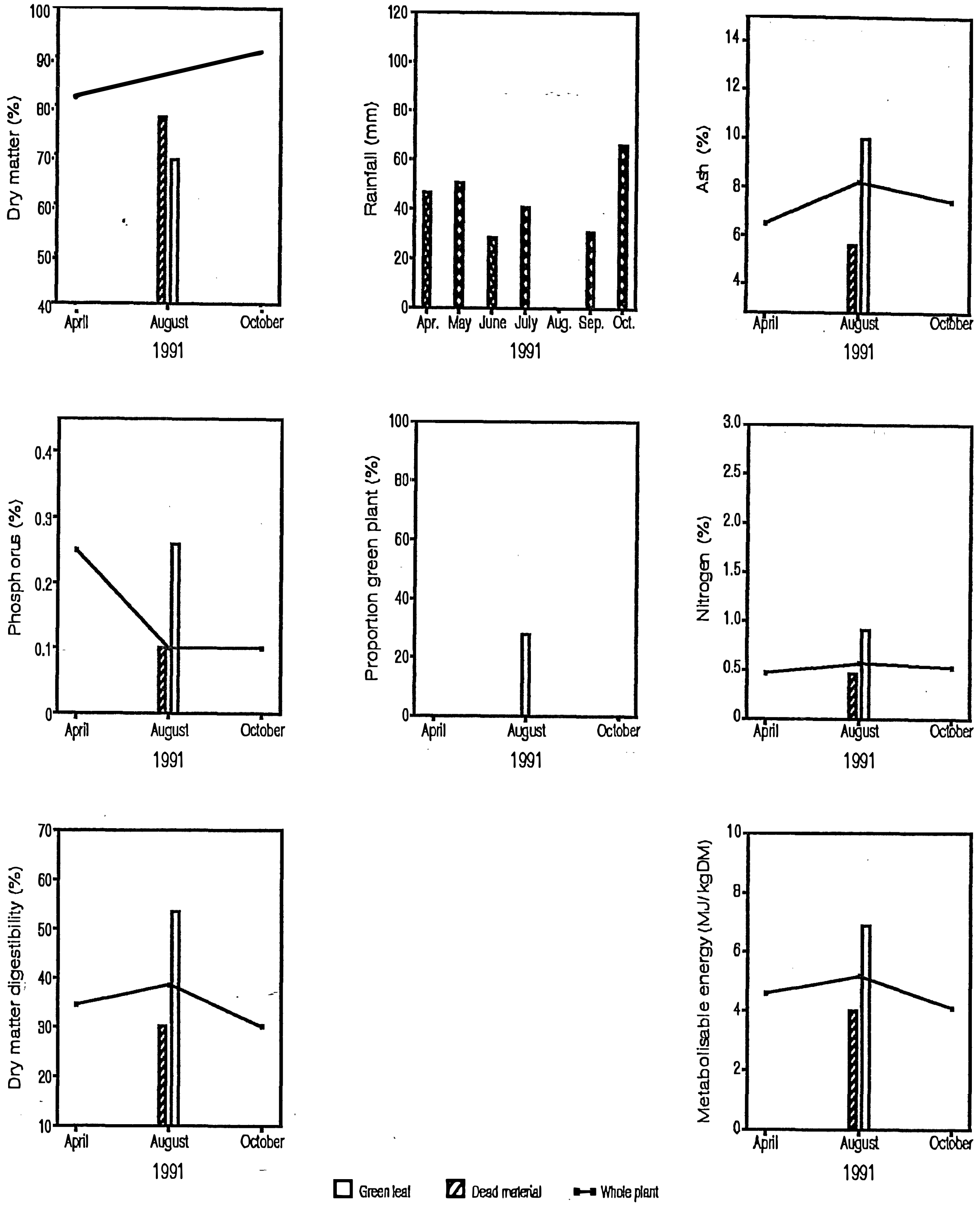

Fig. 7 Biochemical analysis of buffel grass plant components over time from a sown grass paddock at Brigalow Research Station during 1991

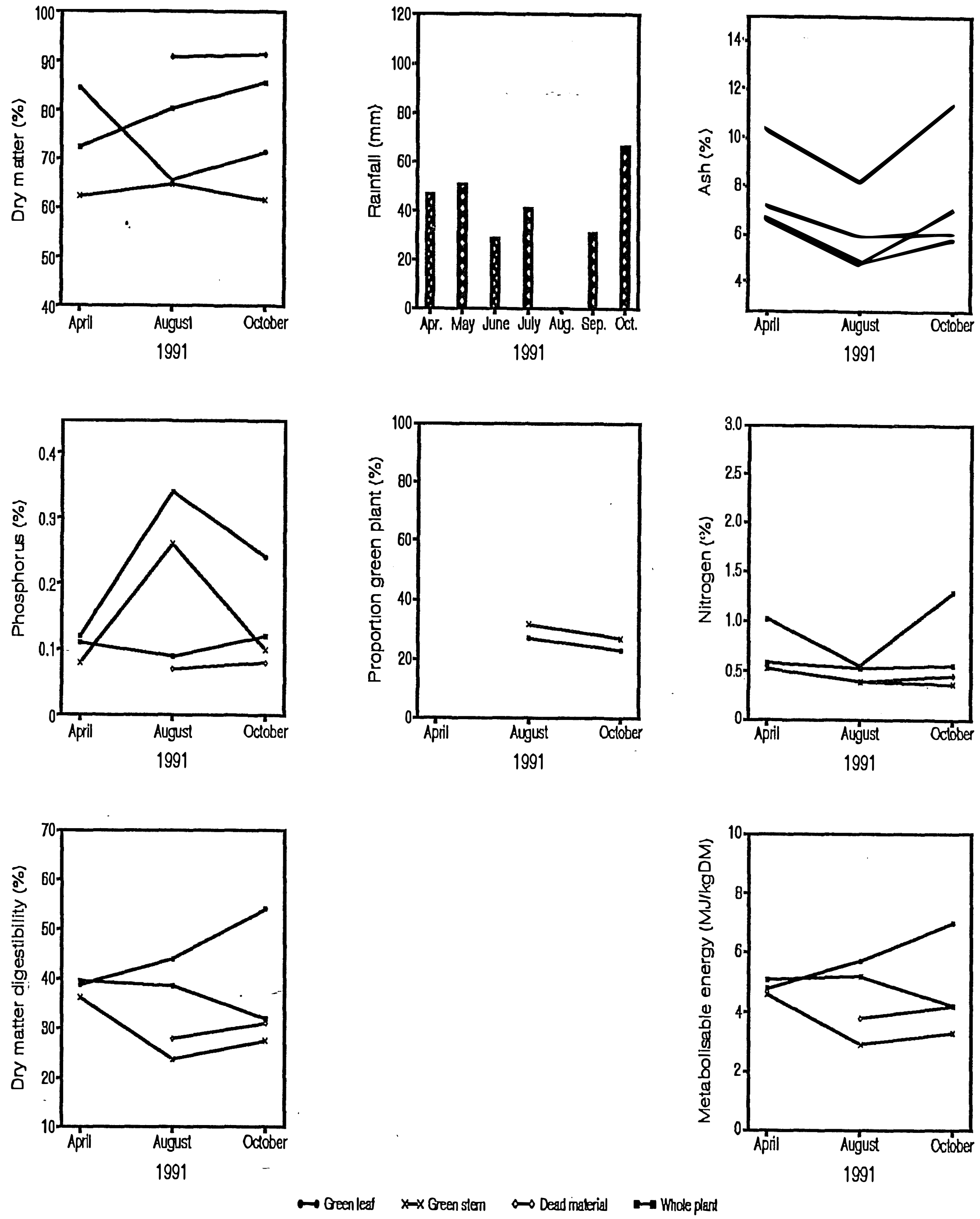

Fig. 8 Biochemical analysis of rhodes grass plant components over time from a sown grass paddock at Brigalow Research Station during 1991

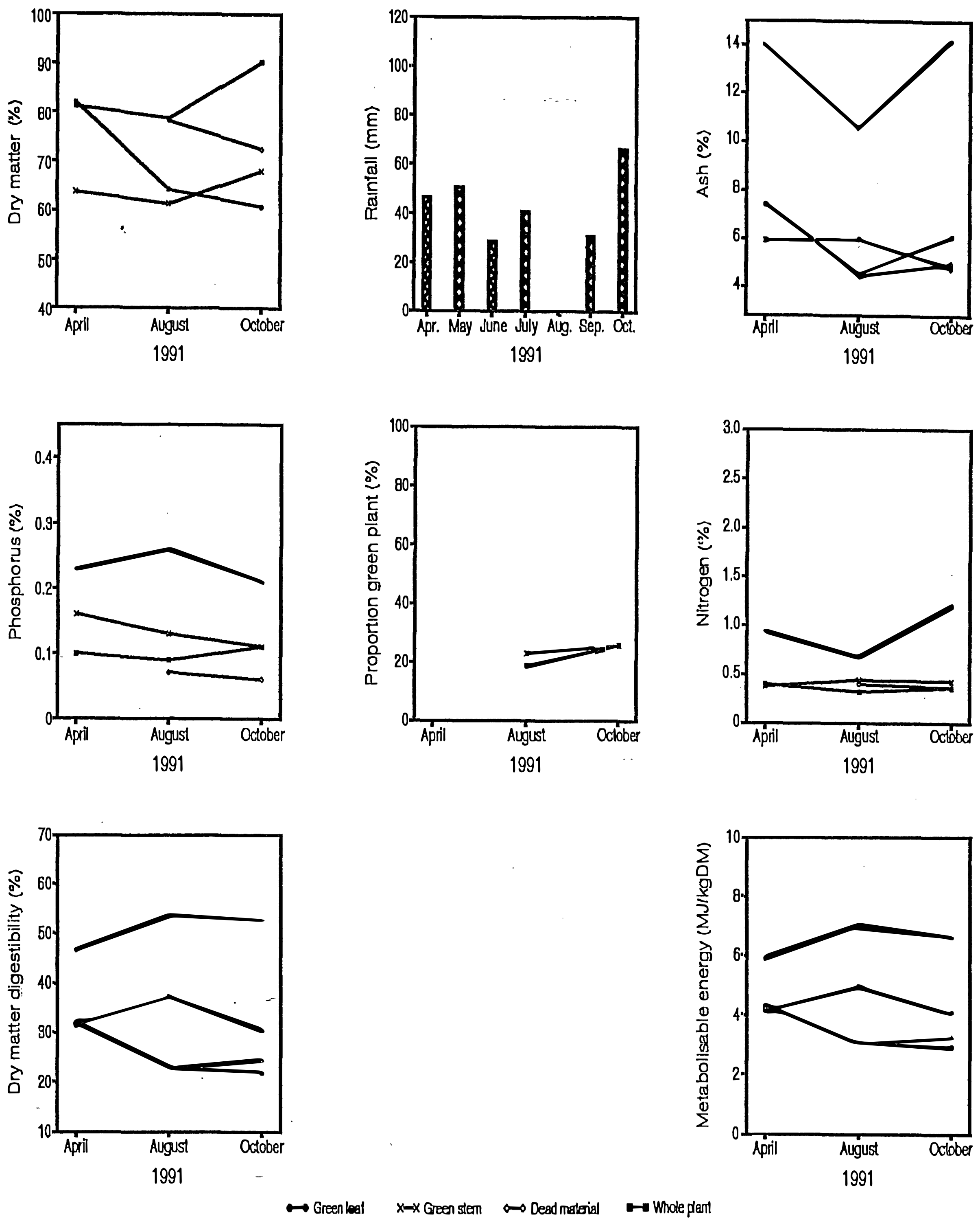

Fig. 9 Biochemical analysis of buffel grass plant components over time from a sown grass-Seca stylo paddock at Brigalow Research Station during 1991

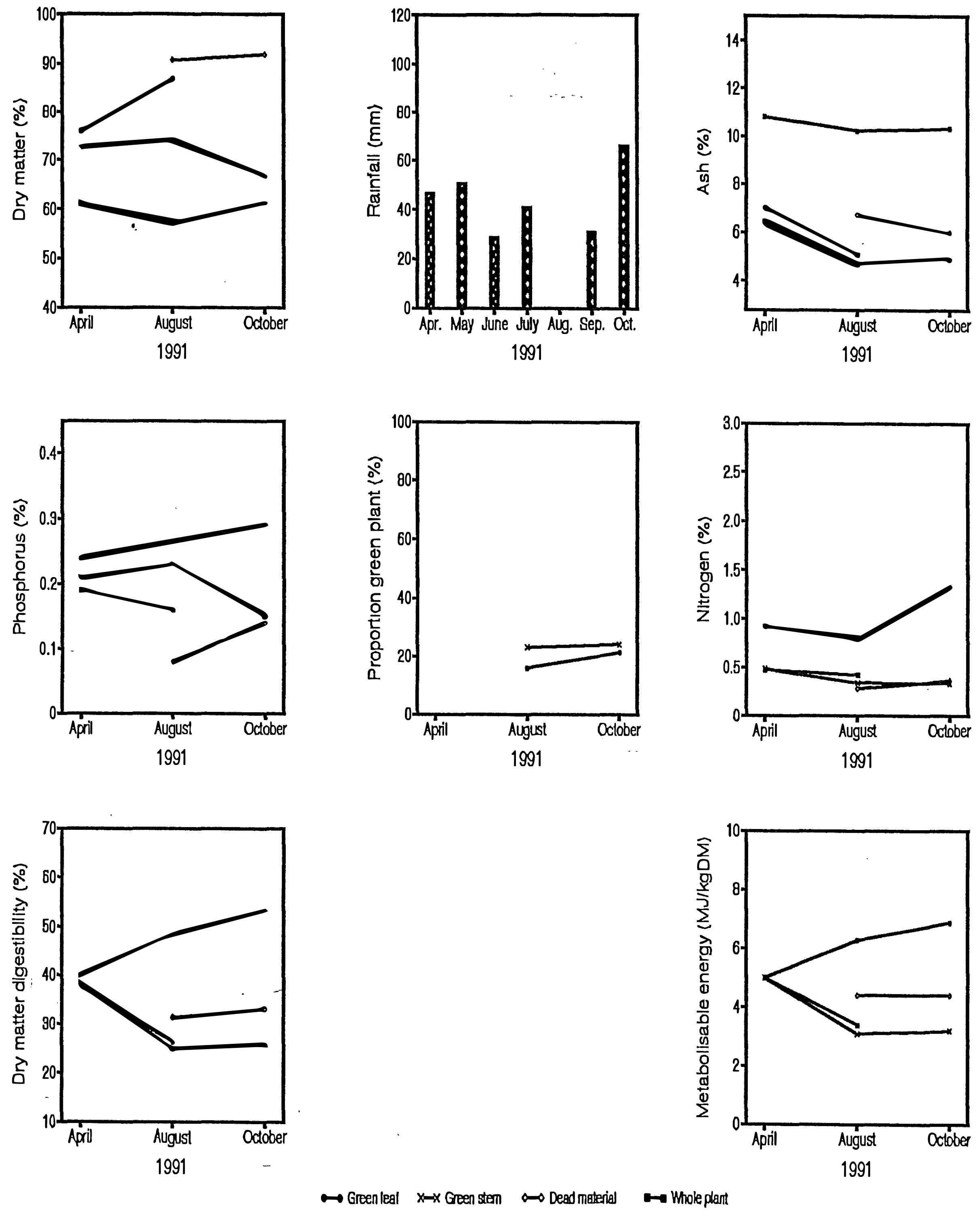

Fig. 10 Biochemical analysis of rhodes grass plant components over time from a sown grass-Seca stylo paddock at Brigalow Research Station during 1991

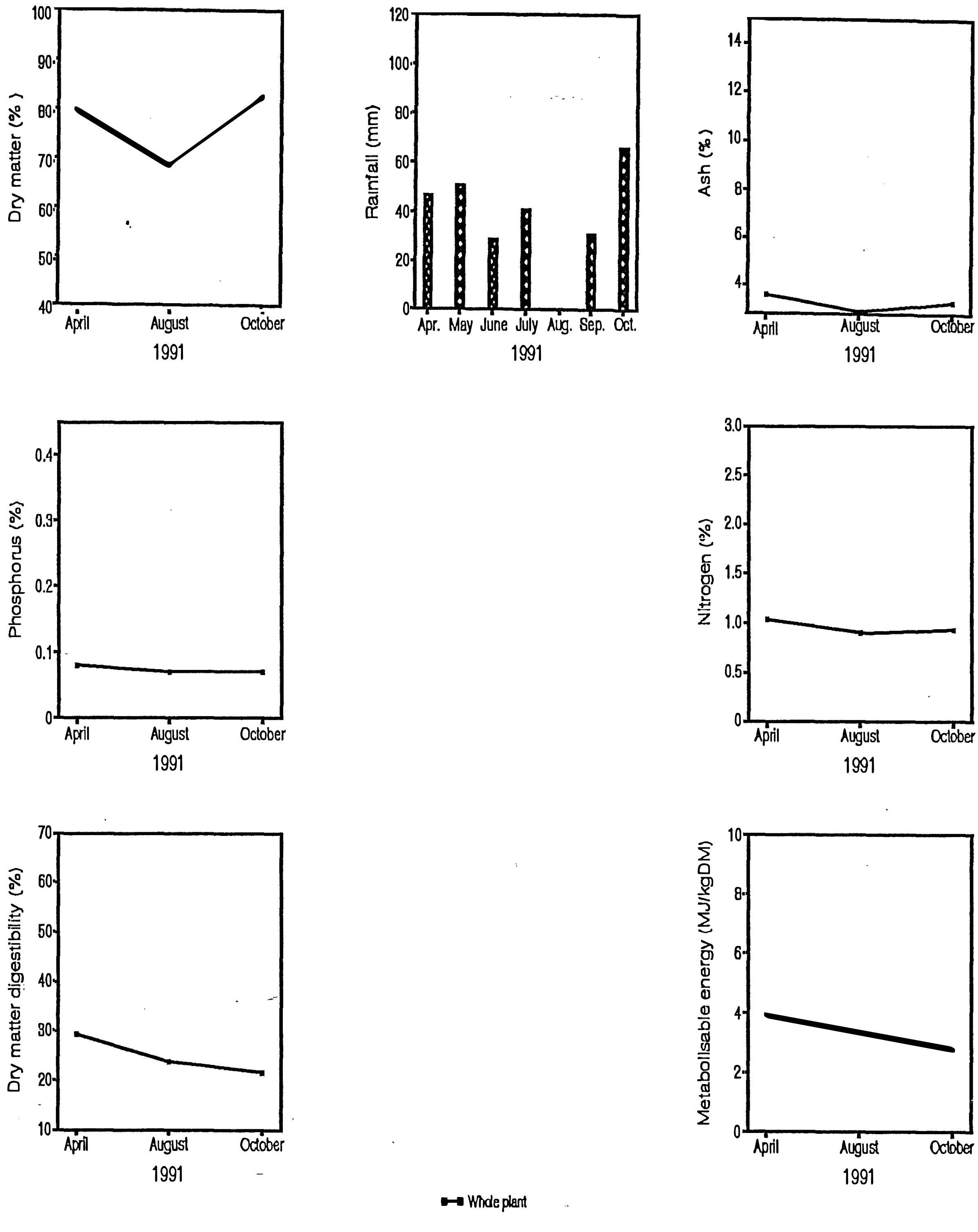

Fig. 11 Biochemical analysis of Seca stylo plants over time from a sown grass-Seca stylo paddock at Brigalow Research Station during 1991

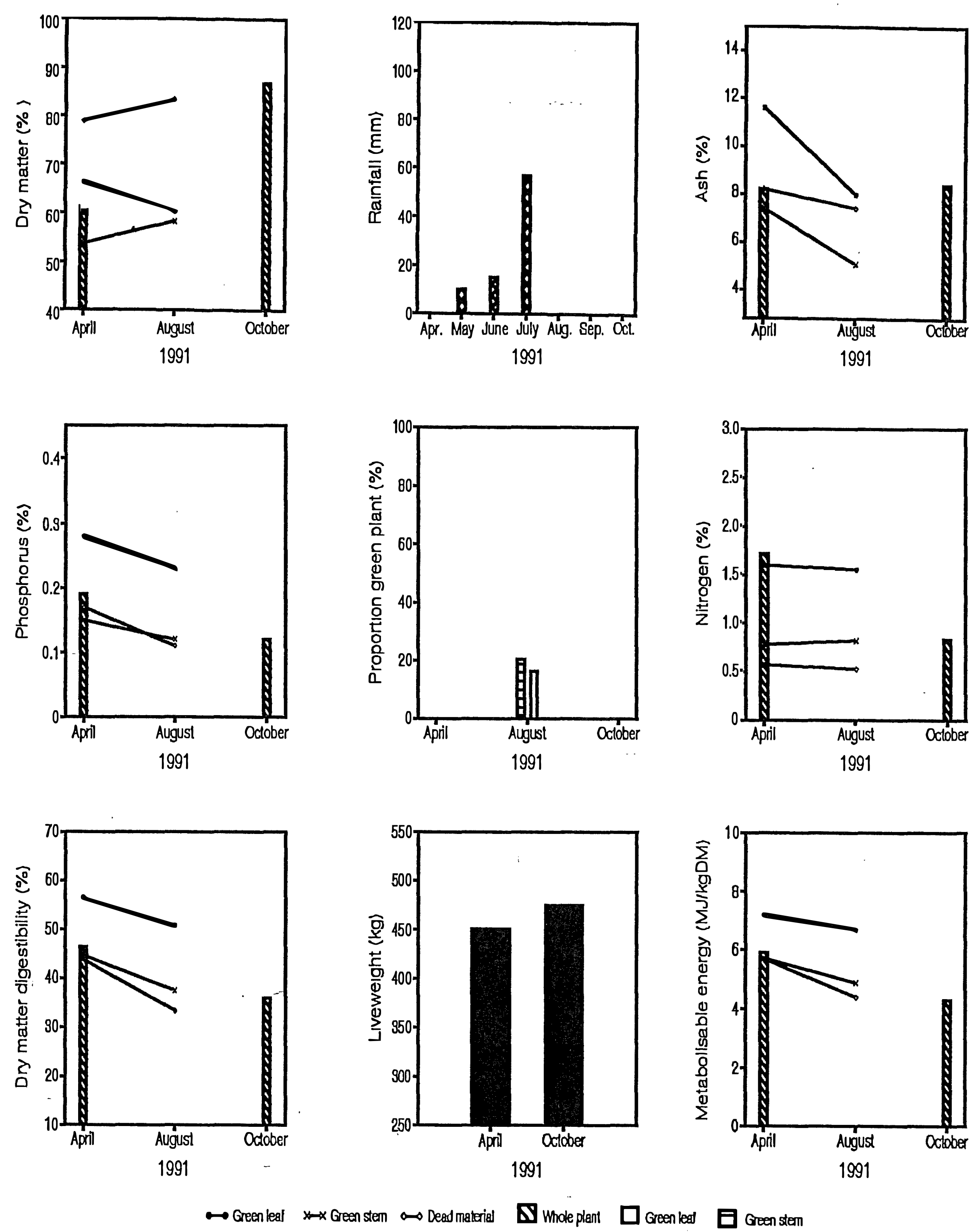

Fig. 12 Biochemical analysis of rhodes grass plant components over time from a sown grass pasture at a Blackwater site during 1991

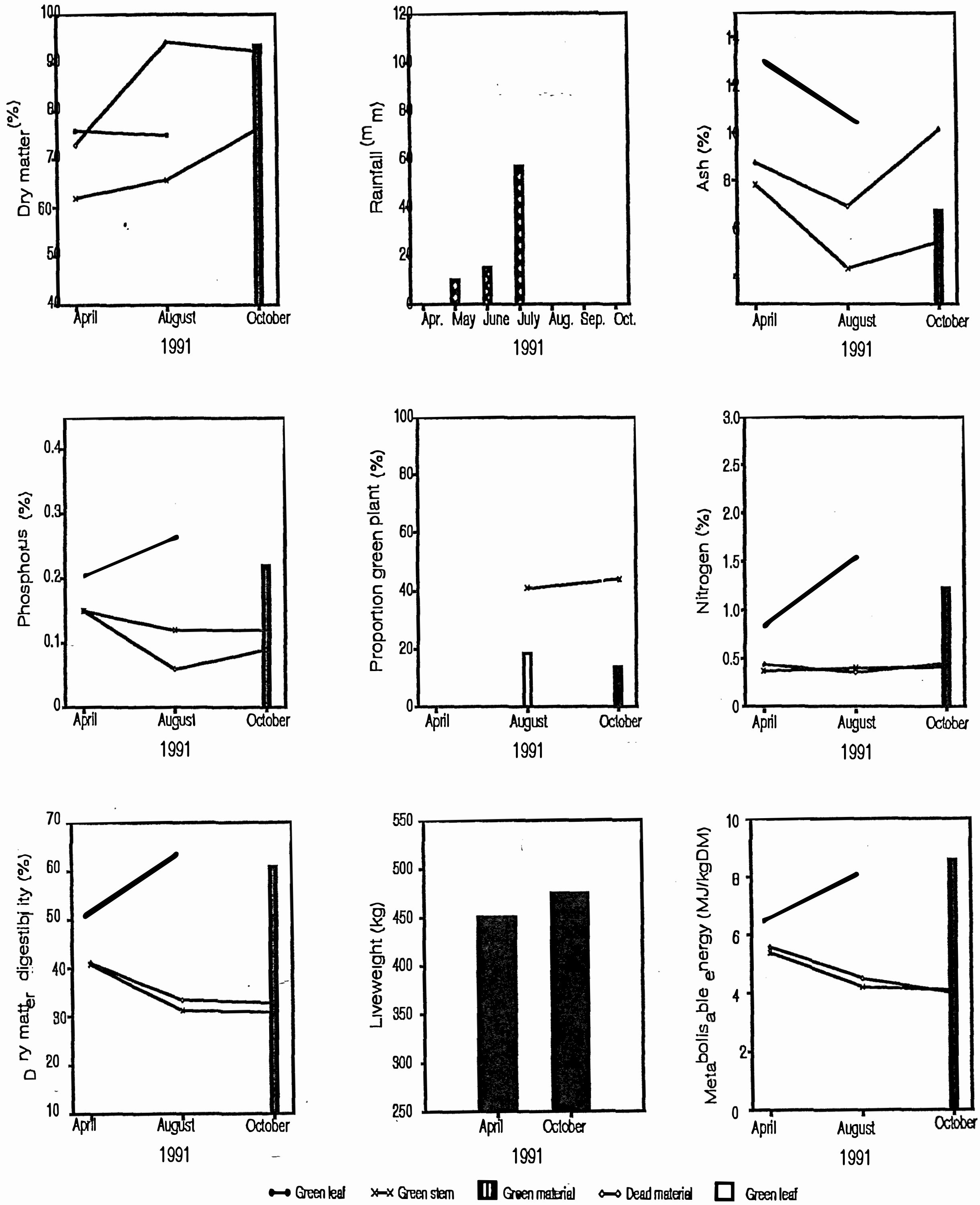

Fig. 13 Biochemical analysis of buffel grass plant components over time from a sown grass pasture at a Blackwater site during 1991

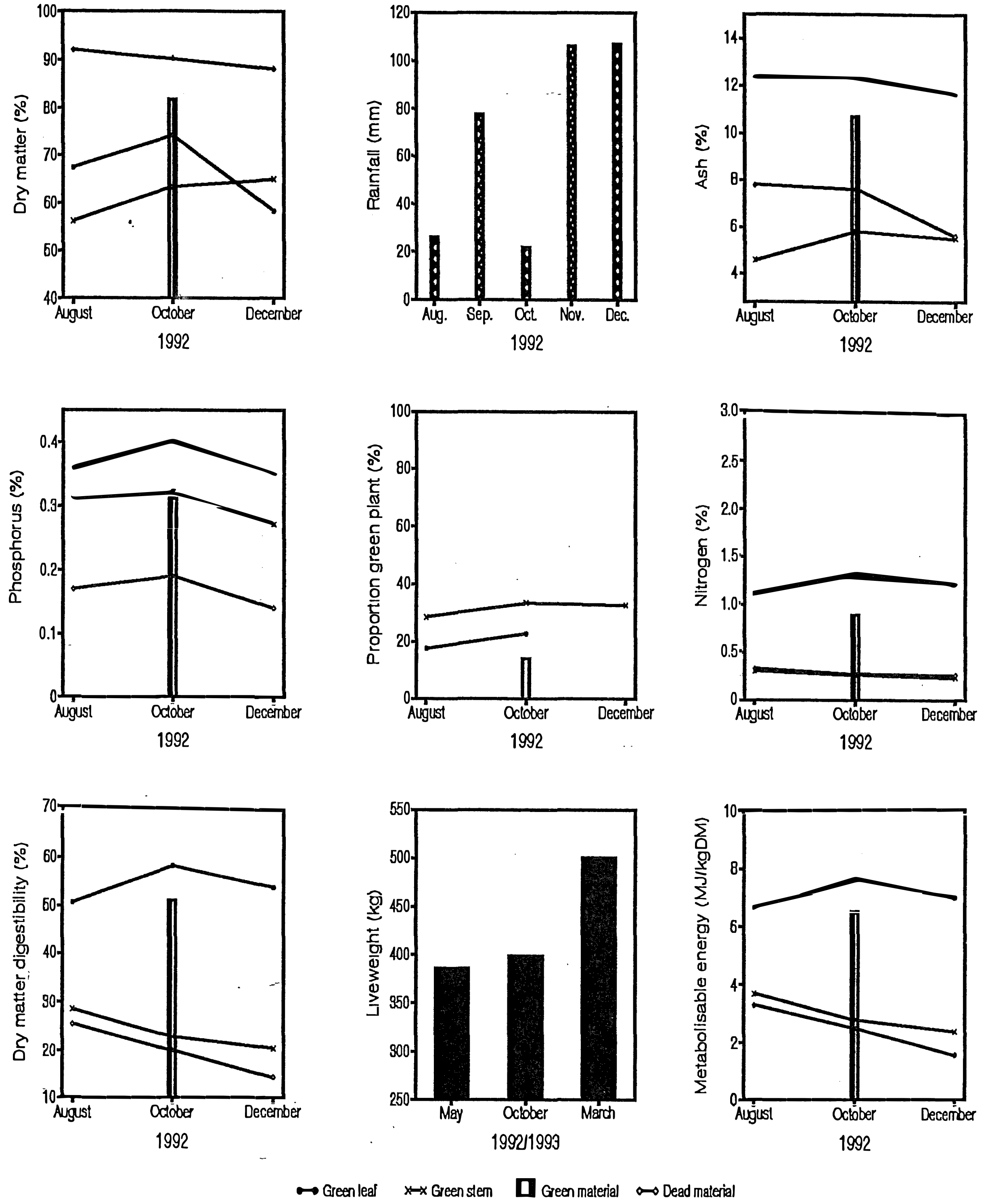

Fig. 14 Biochemical analysis of rhodes grass plant components over time from an improved pasture paddock and corresponding steer liveweights at a Calliope site during 1992

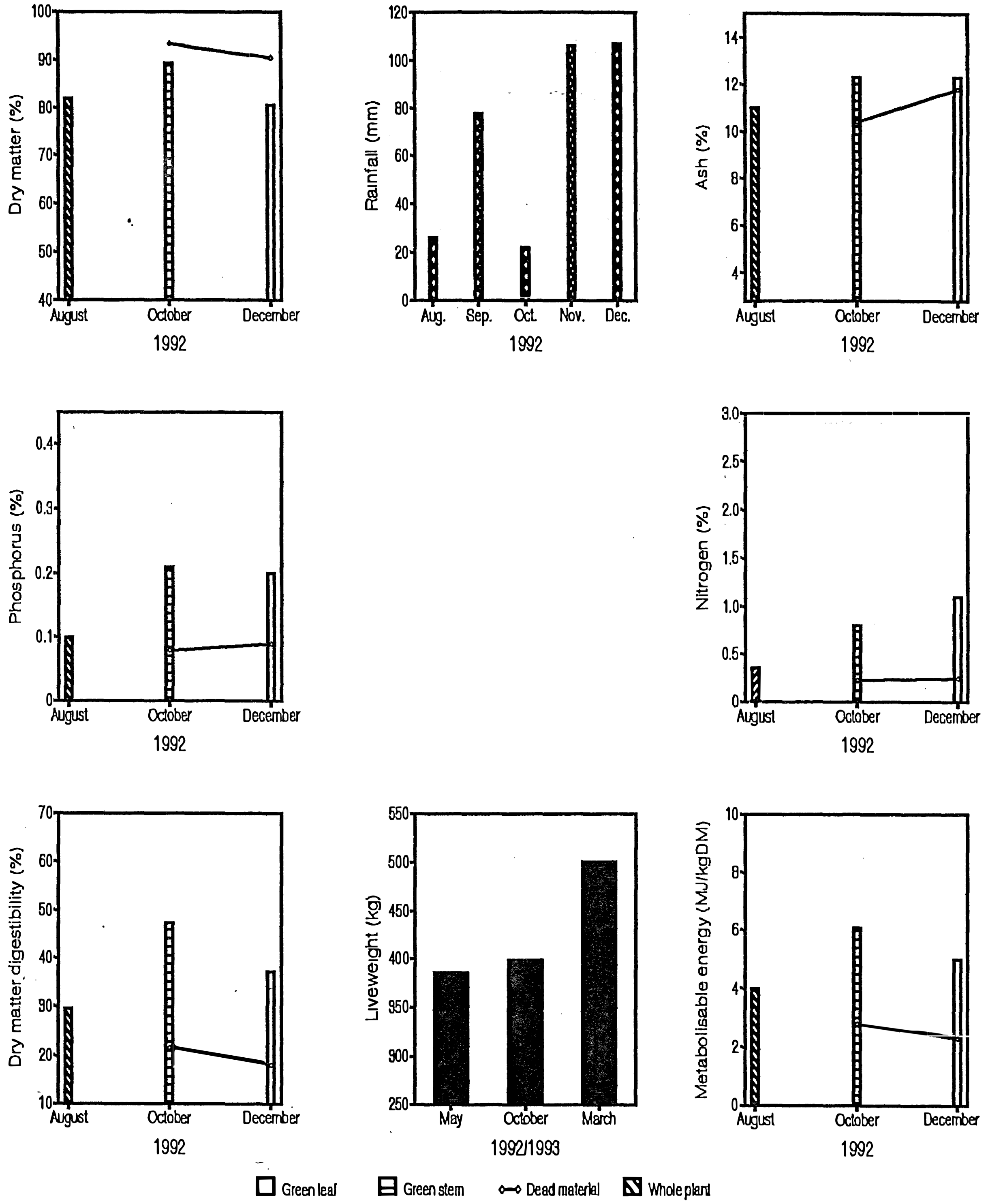

Fig. 15 Biochemical analysis of speargrass plant components over time from an improved pasture paddock and corresponding steer liveweights at a Calliope site during 1992

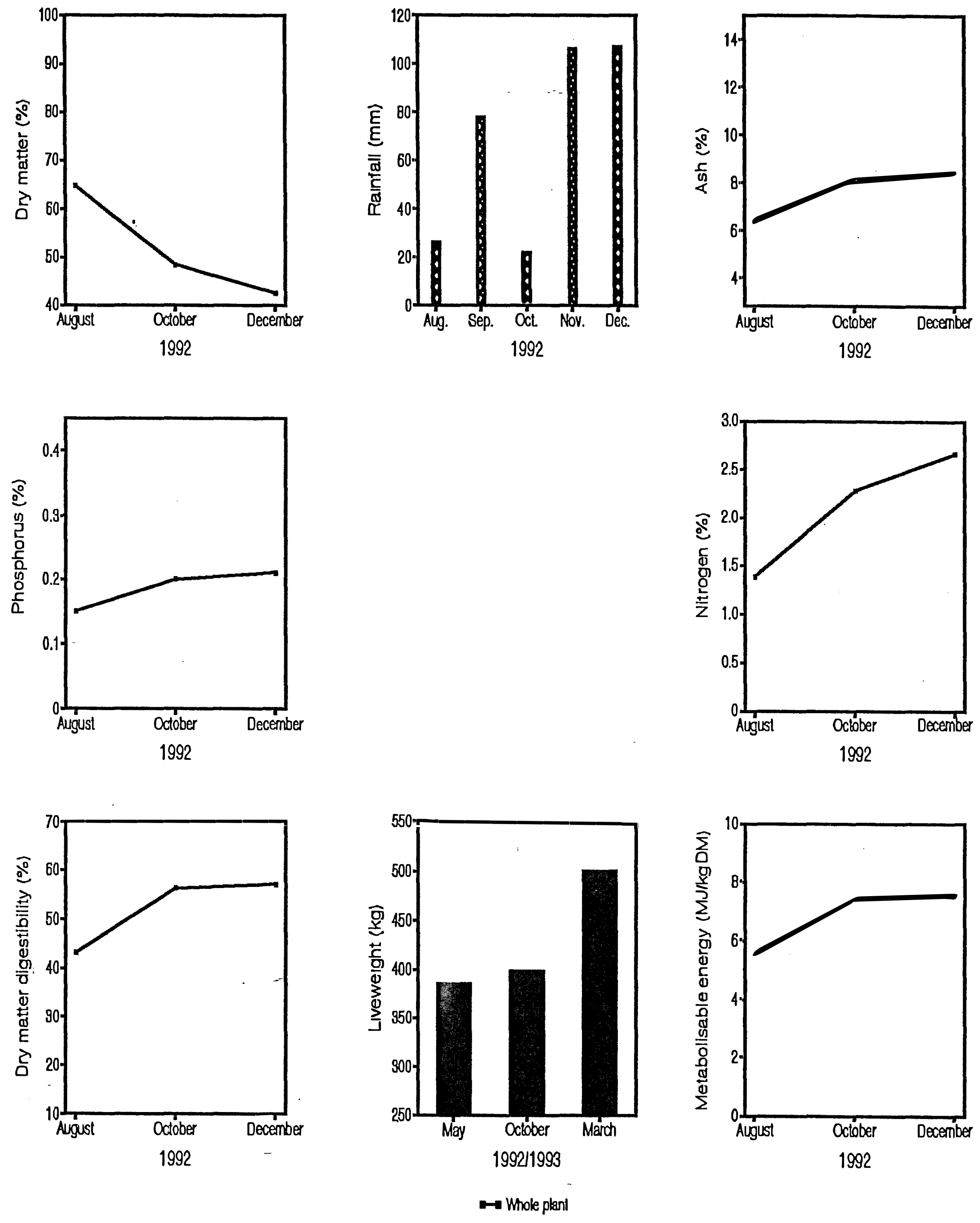

Fig. 16 Biochemical analysis of Siratro plants over time from an improved pasture paddock and corresponding steer liveweights at a Calliope site during 1992

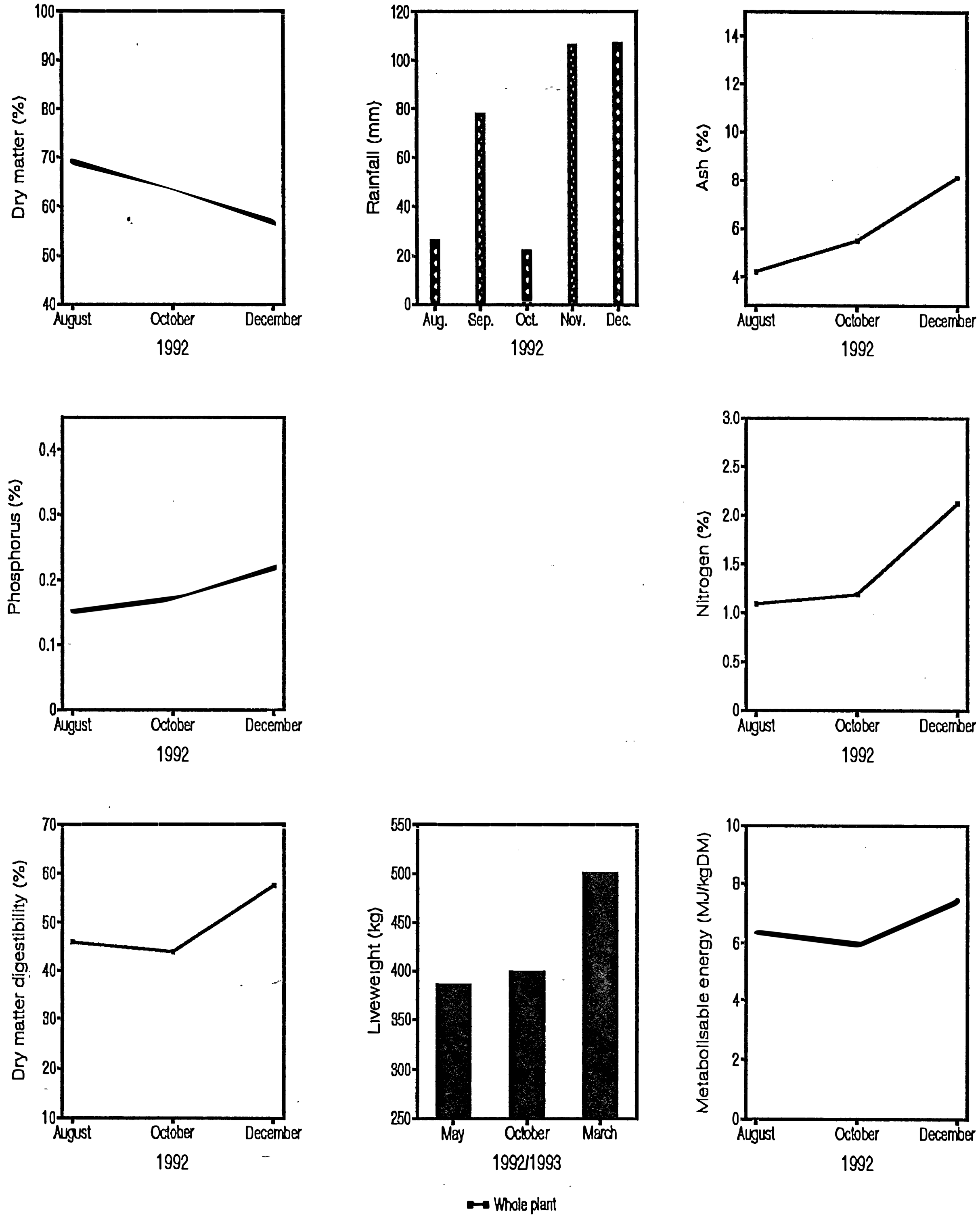

Fig. 17 Biochemical analysis of Wyn cassia plants over time from an improved pasture paddock and corresponding steer liveweights from a Calliope site during 1992

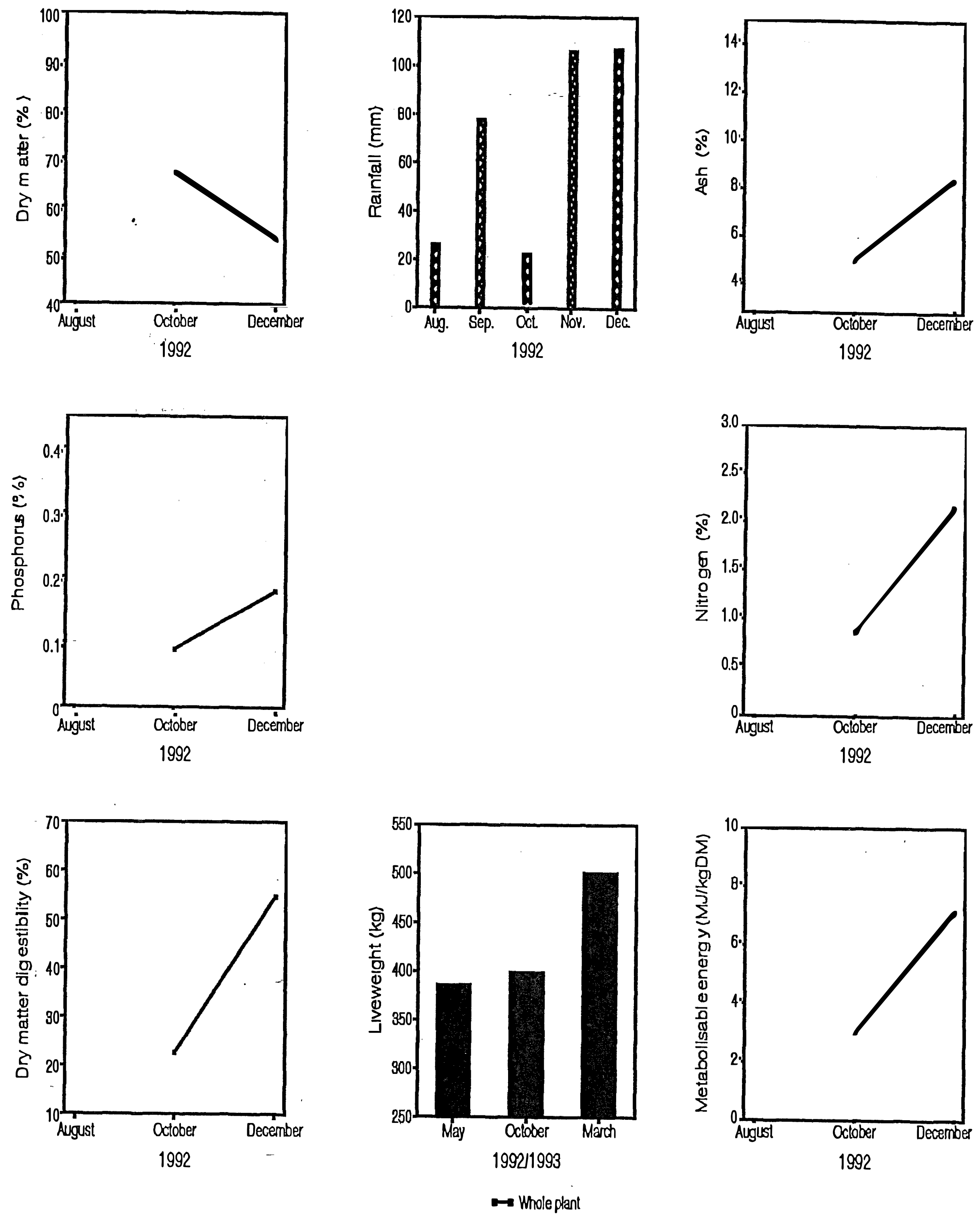

Fig. 18 Biochemical analysis of Seca stylo plants over time from an improved pasture paddock and corresponding steer liveweights at a Calliope site during 1992

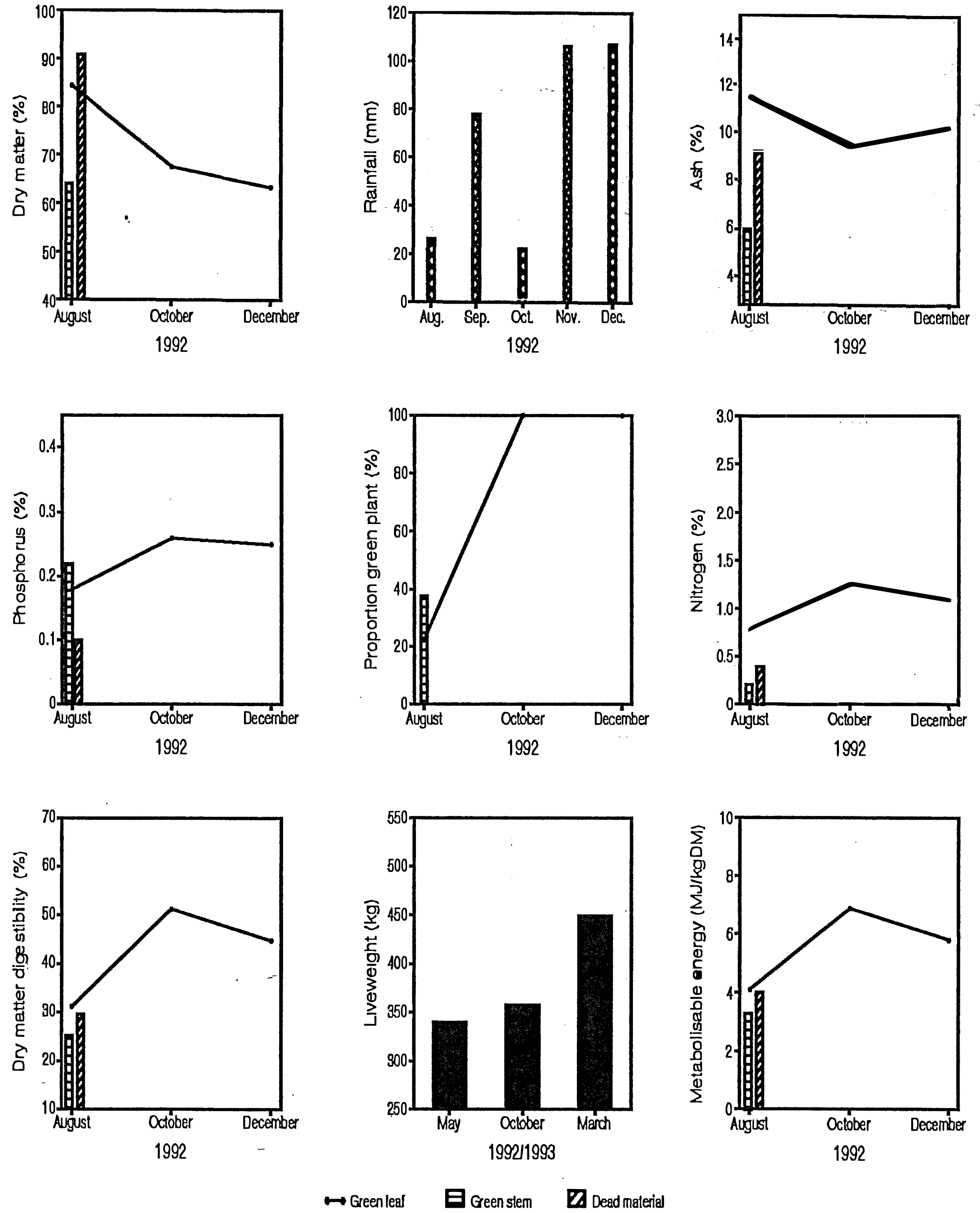

Fig. 19 Biochemical analysis of speargrass plant components over time from a native pasture paddock and corresponding steer liveweights from a Calliope site during 1992

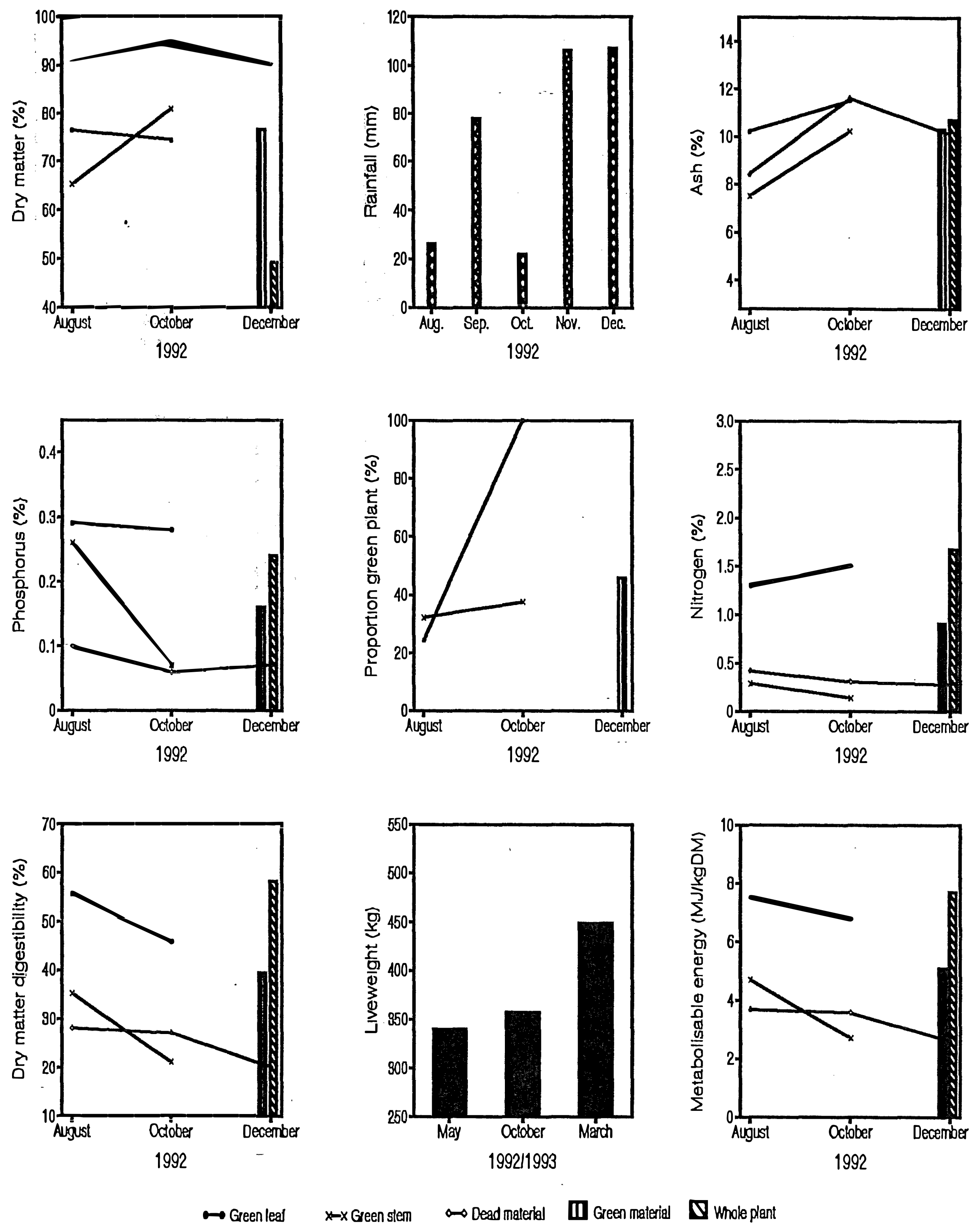

Fig. 20 Biochemical analysis of bluegrass plant components over time from a native pasture paddock and corresponding steer liveweights at a Calliope site during 1992

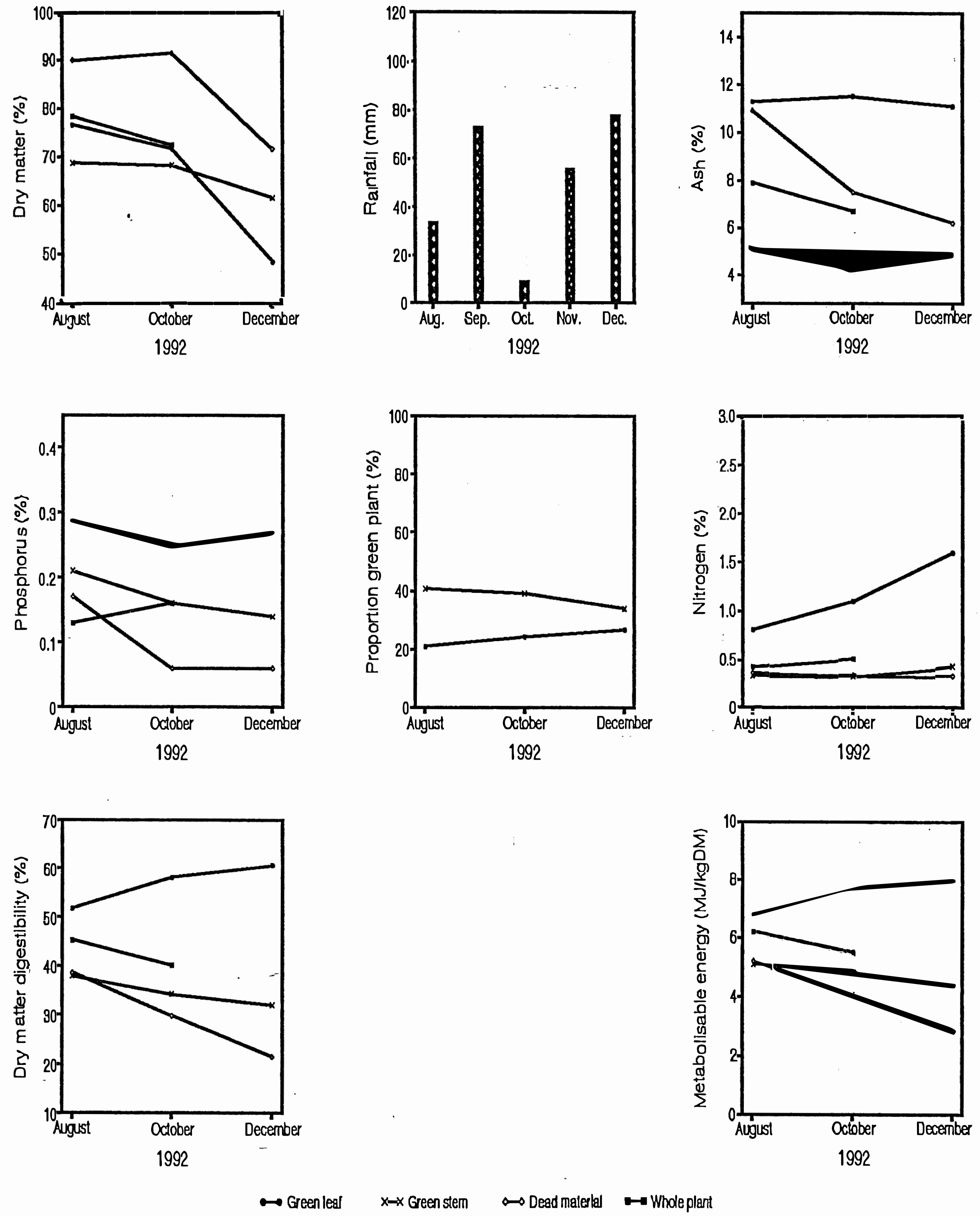

Fig. 21 Biochemical analysis of buffel grass plant components over time from a sown grass paddock at Brigalow Research Station during 1992

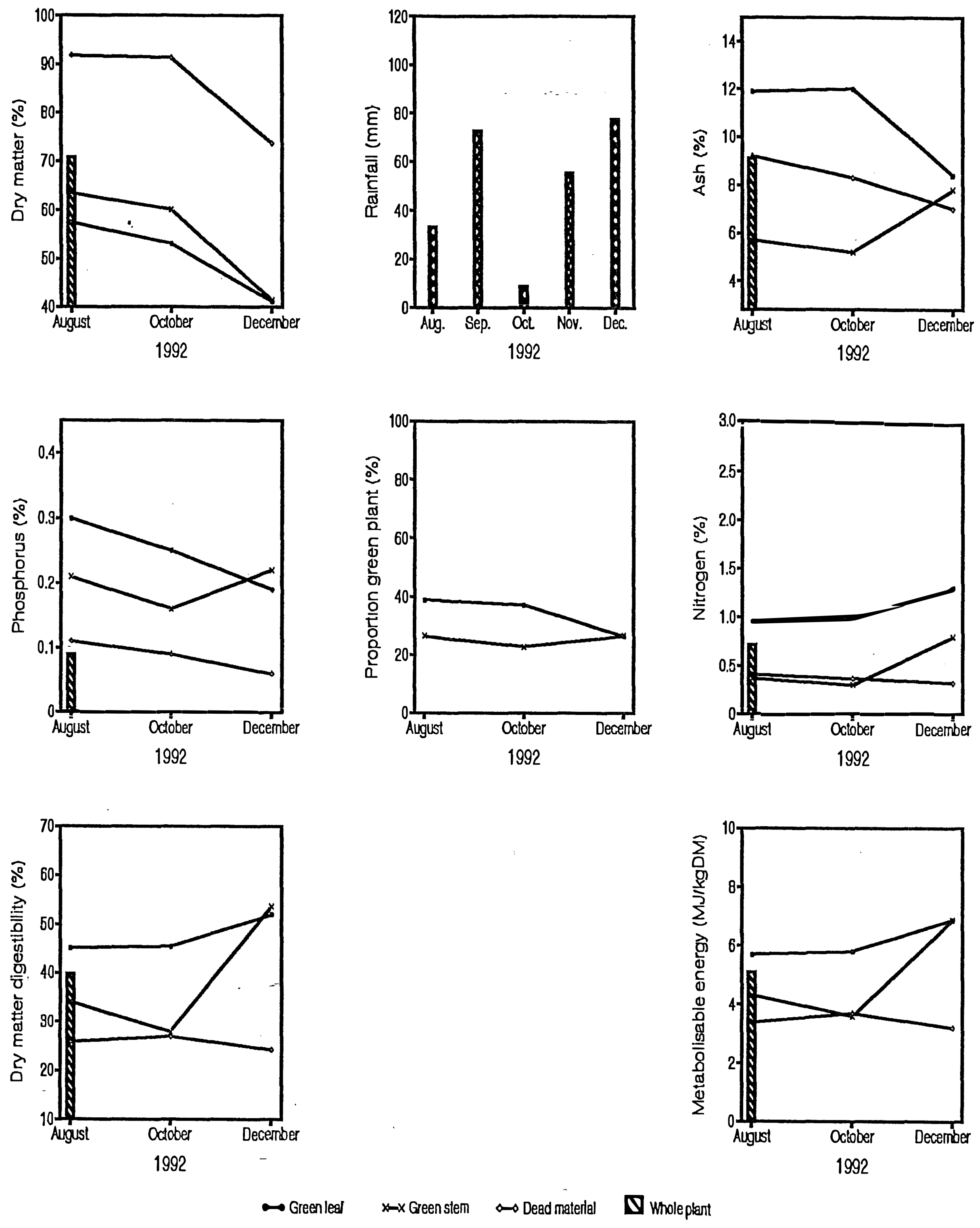

Fig. 22 Biochemical analysis of rhodes grass plant components over time from a sown grass paddock at Brigalow Research Station during 1992

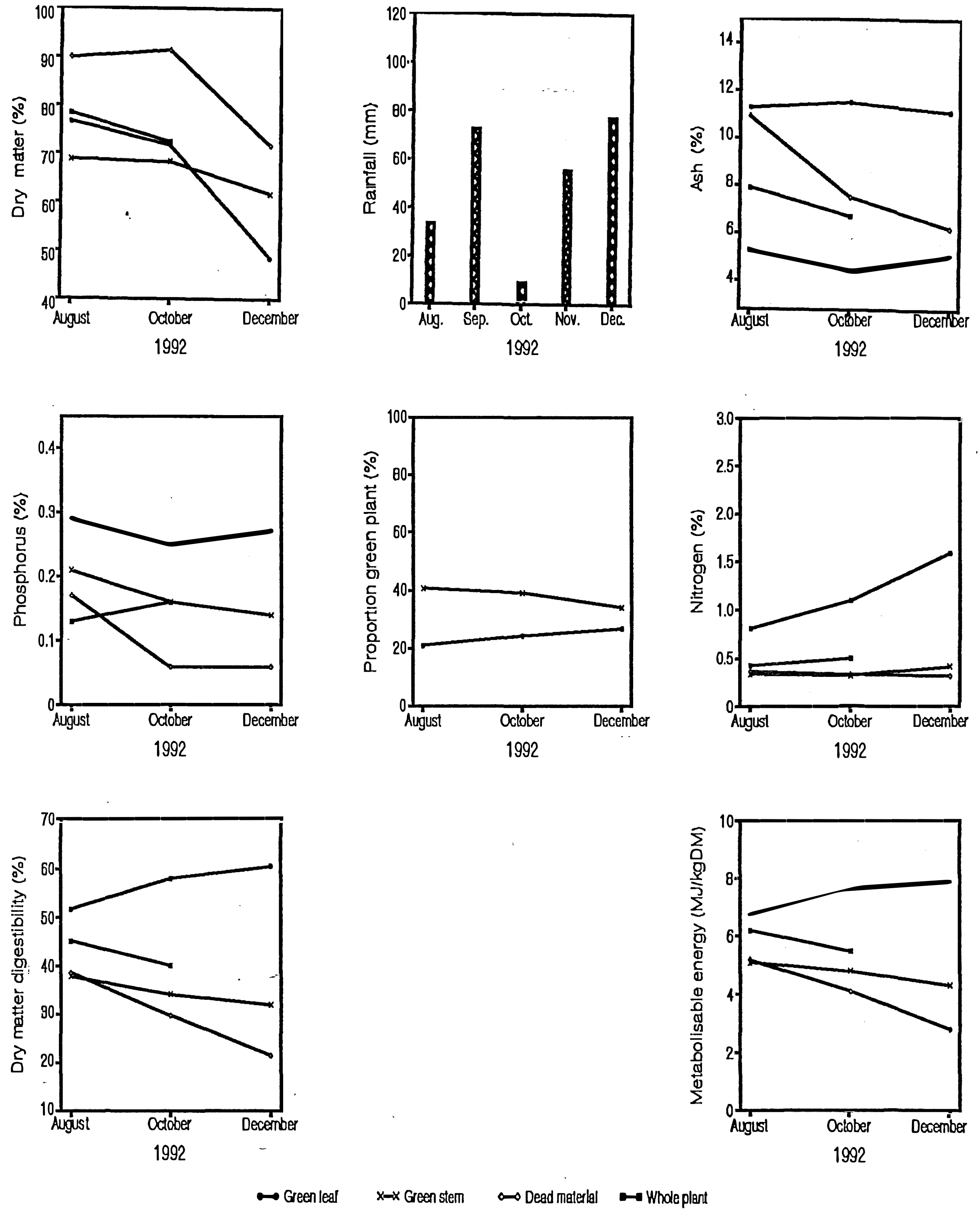

Fig. 23 Biochemical analysis of buffel grass plant components over time from a sown grass-Seca stylo paddock at Brigalow Research Station during 1992

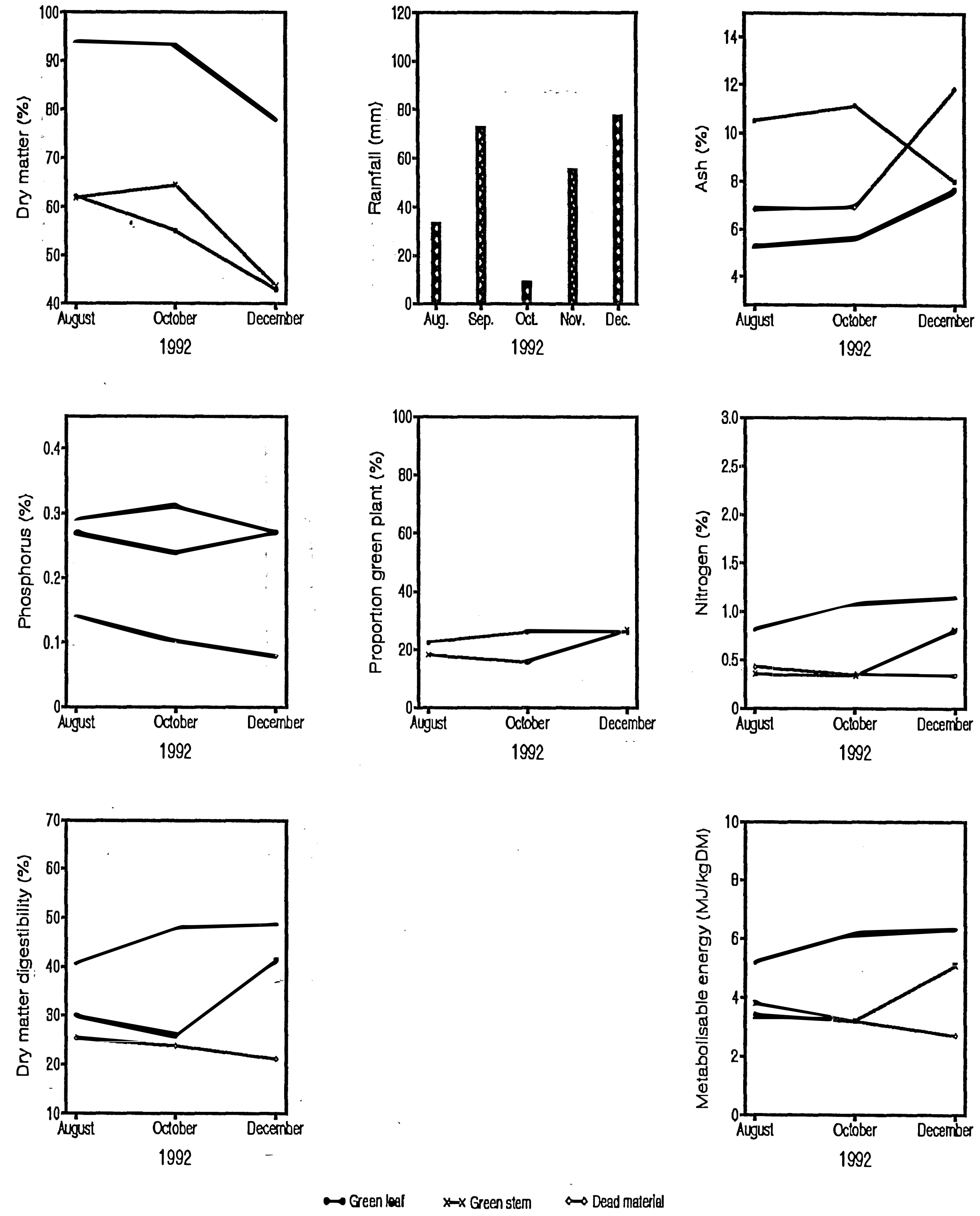

Fig. 24 Biochemical analysis of rhodes grass plant components over time from a sown grass-Seca stylo paddock at Brigalow Research Station during 1992

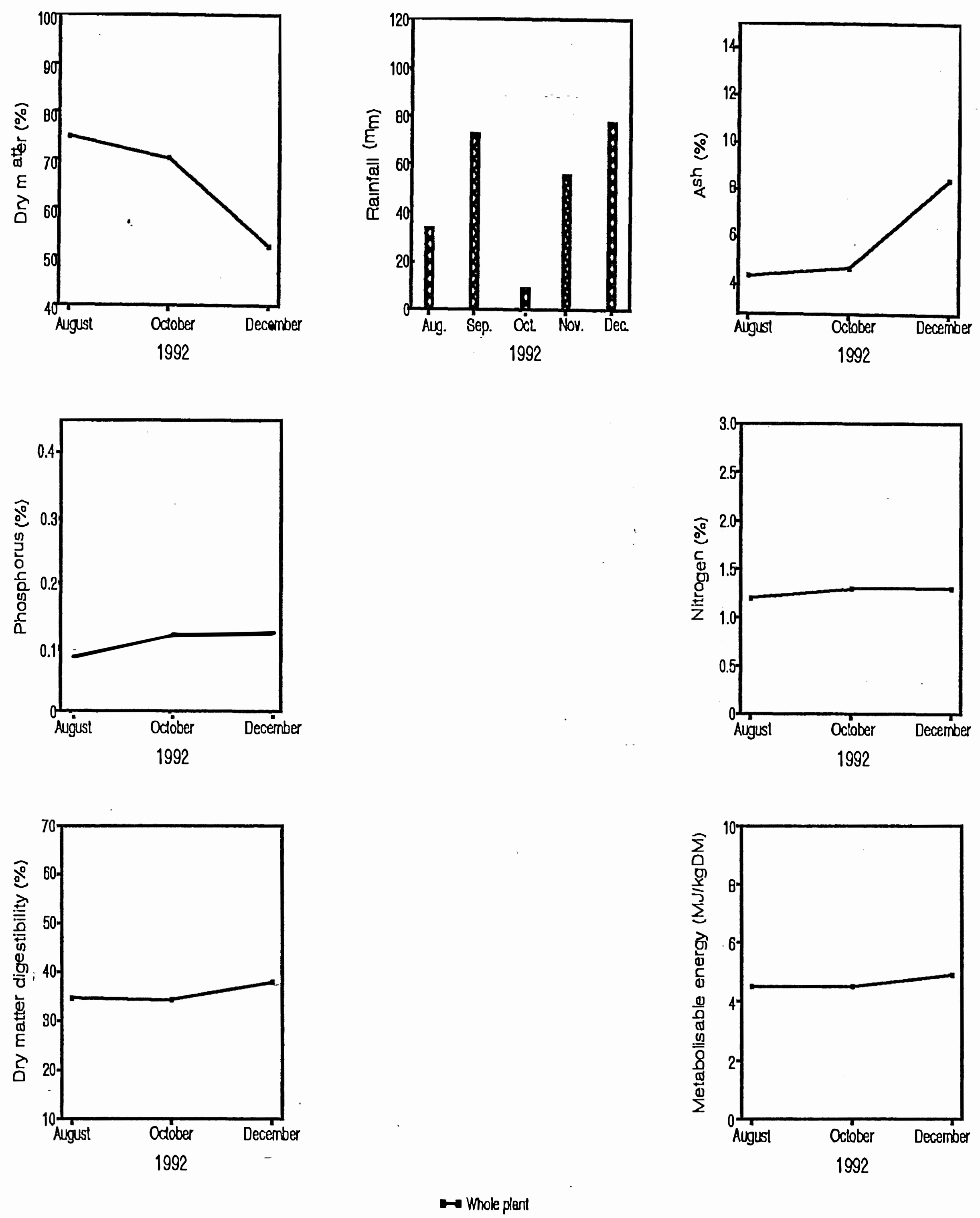

Fig. 25 Biochemical analysis of Seca stylo plants over time from a sown grass-Seca stylo paddock at Brigalow Research Station during 1992

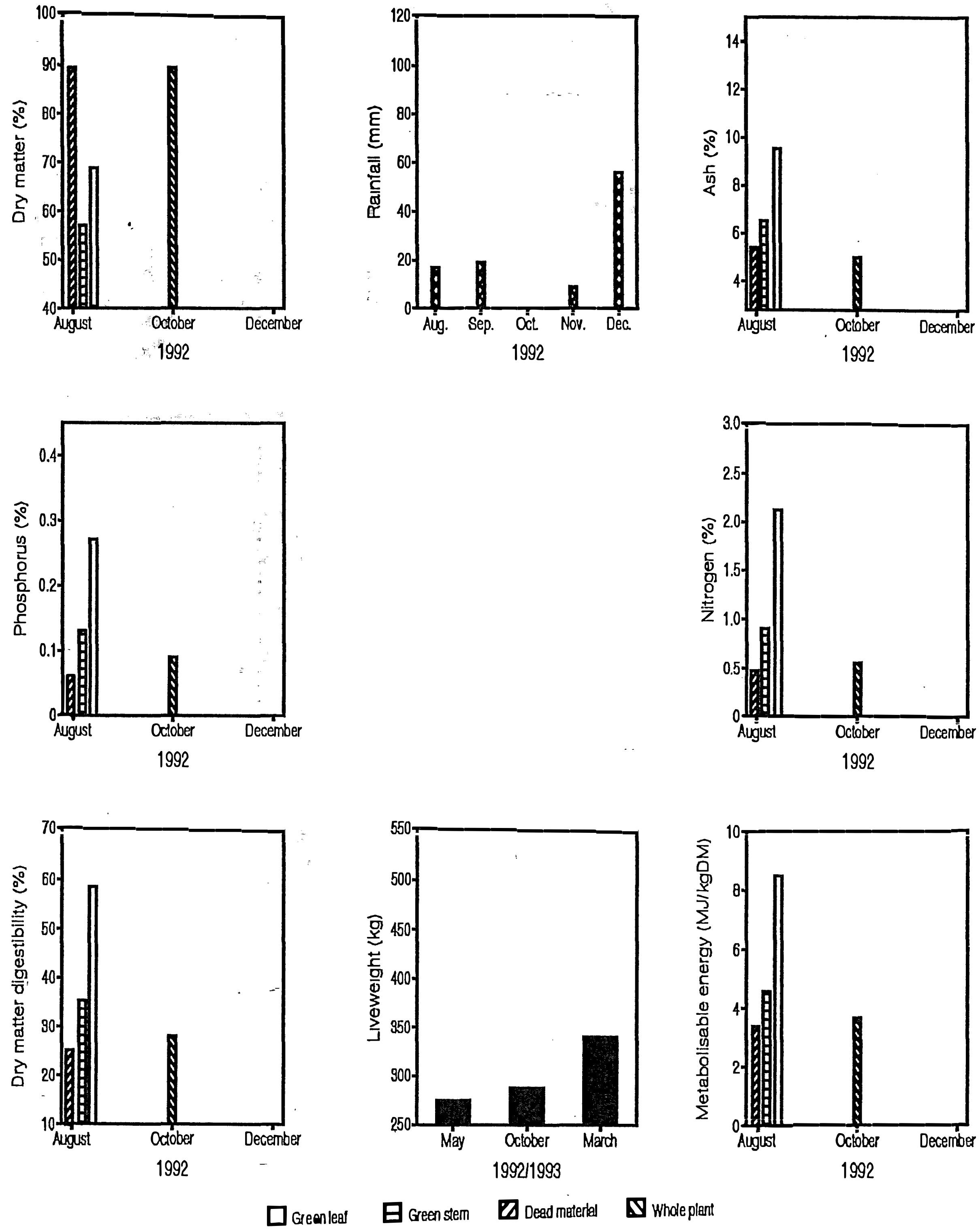

Fig. 26 Biochemical analysis of rhodes grass plant components over time from a sown grass pasture at a Blackwater site during 1992

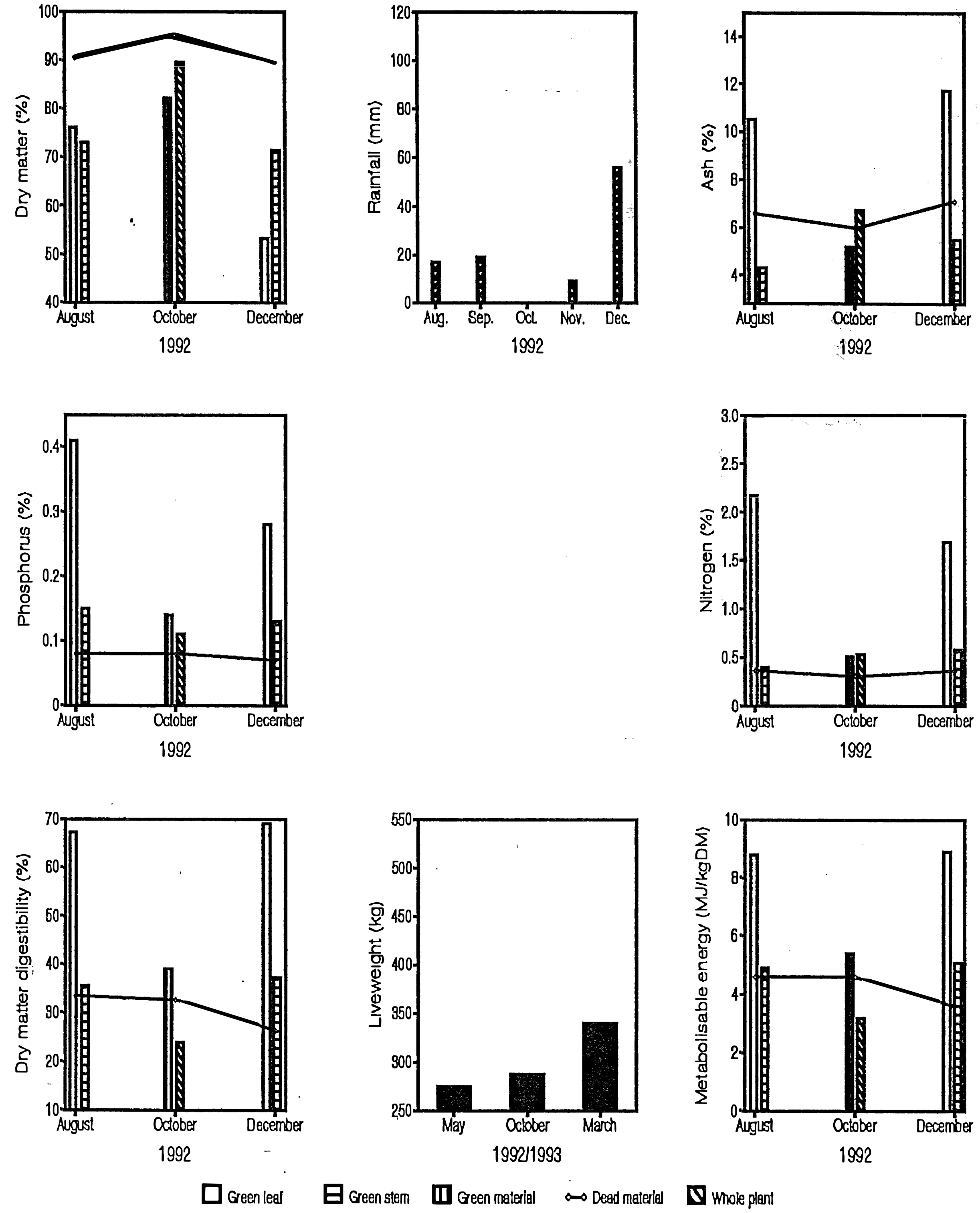

Fig. 27 Biochemical analysis of buffel grass plant components over time from a sown grass pasture at a Blackwater site during 1992

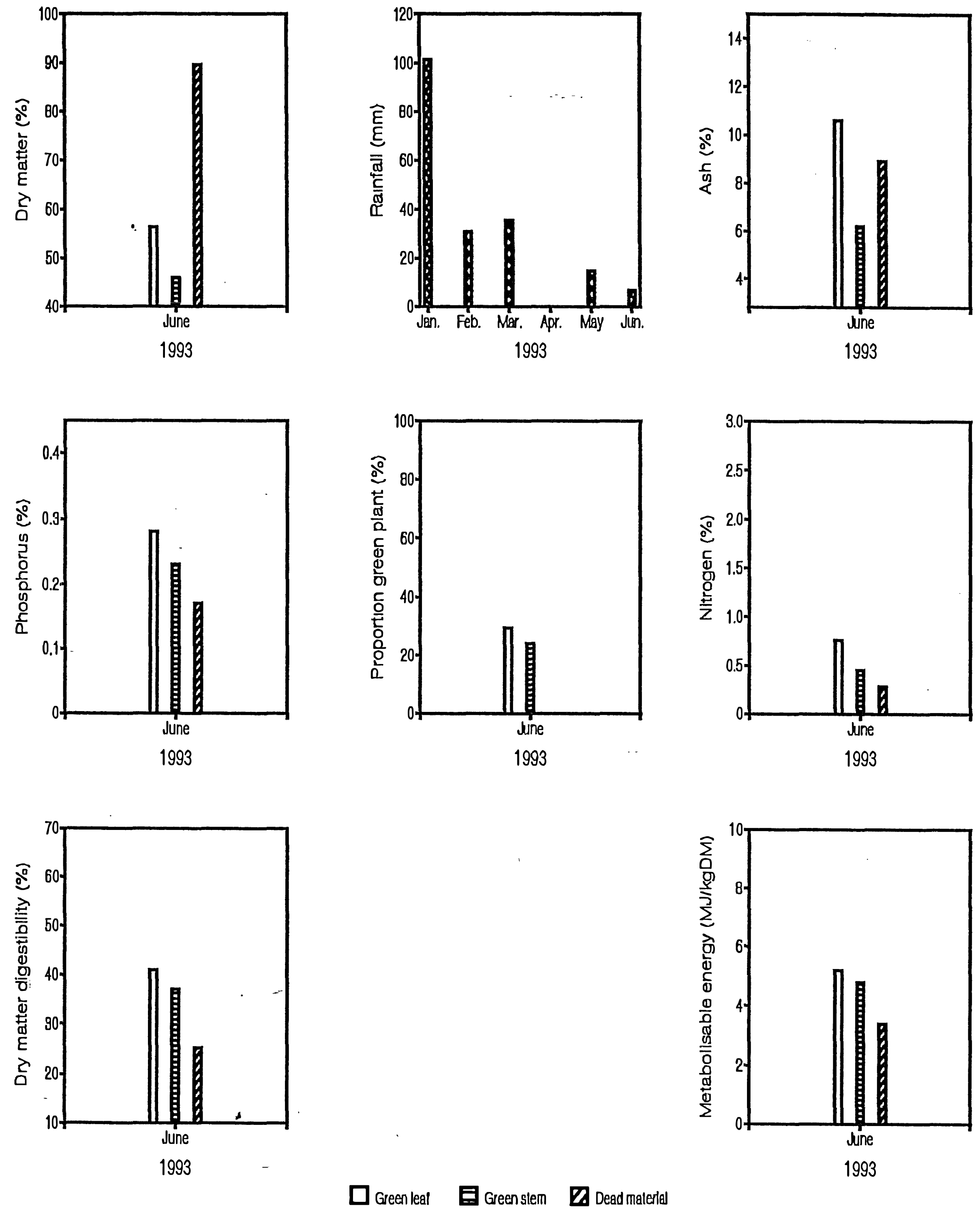

Fig. 28 Biochemical analysis of rhodes grass plant components over time from an improved pasture paddock at a Calliope site in June 1993

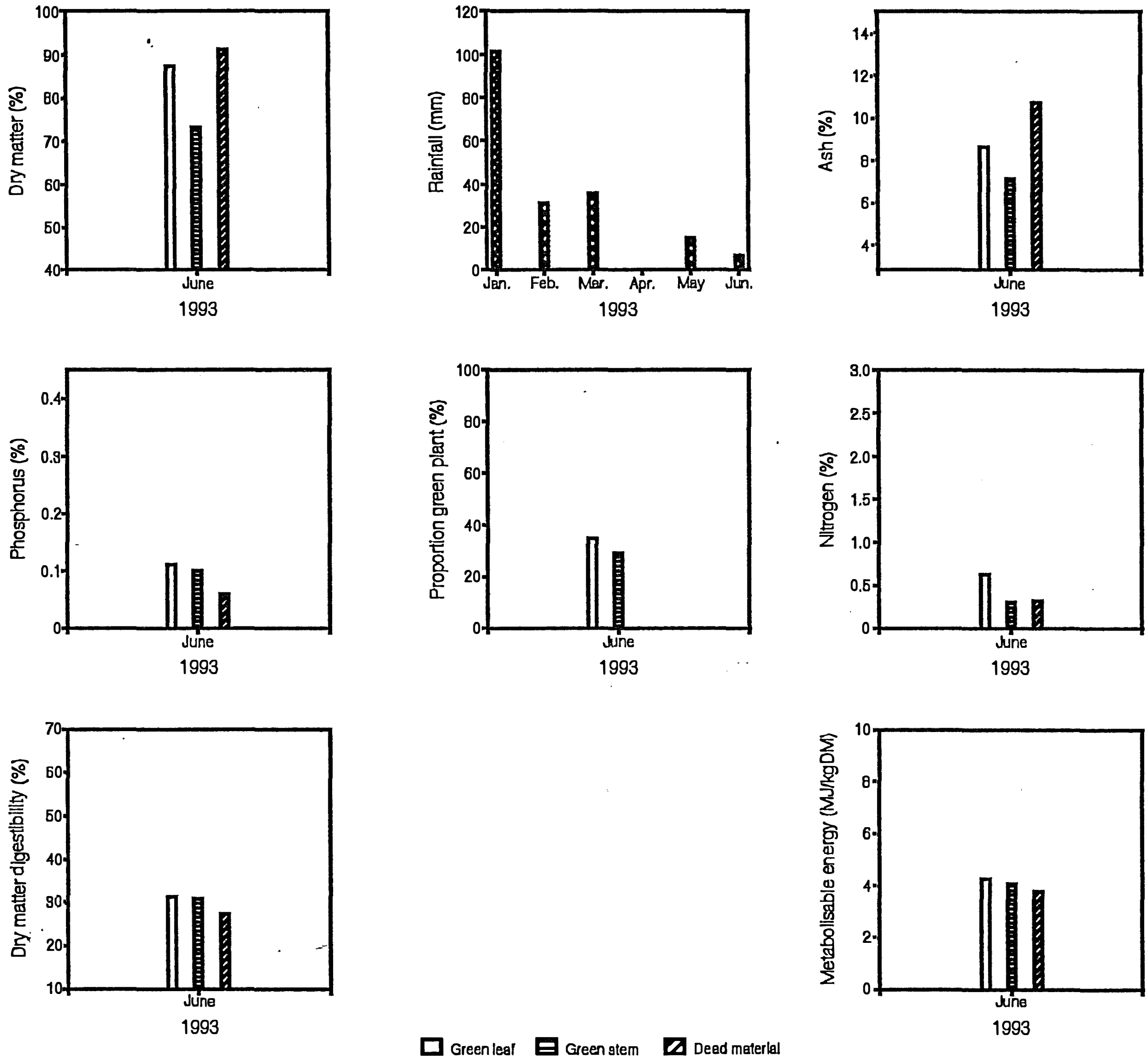

Fig. 29 Biochemical analysis of speargrass plant components over time from an improved pasture paddock at a Calliope site in June 1993

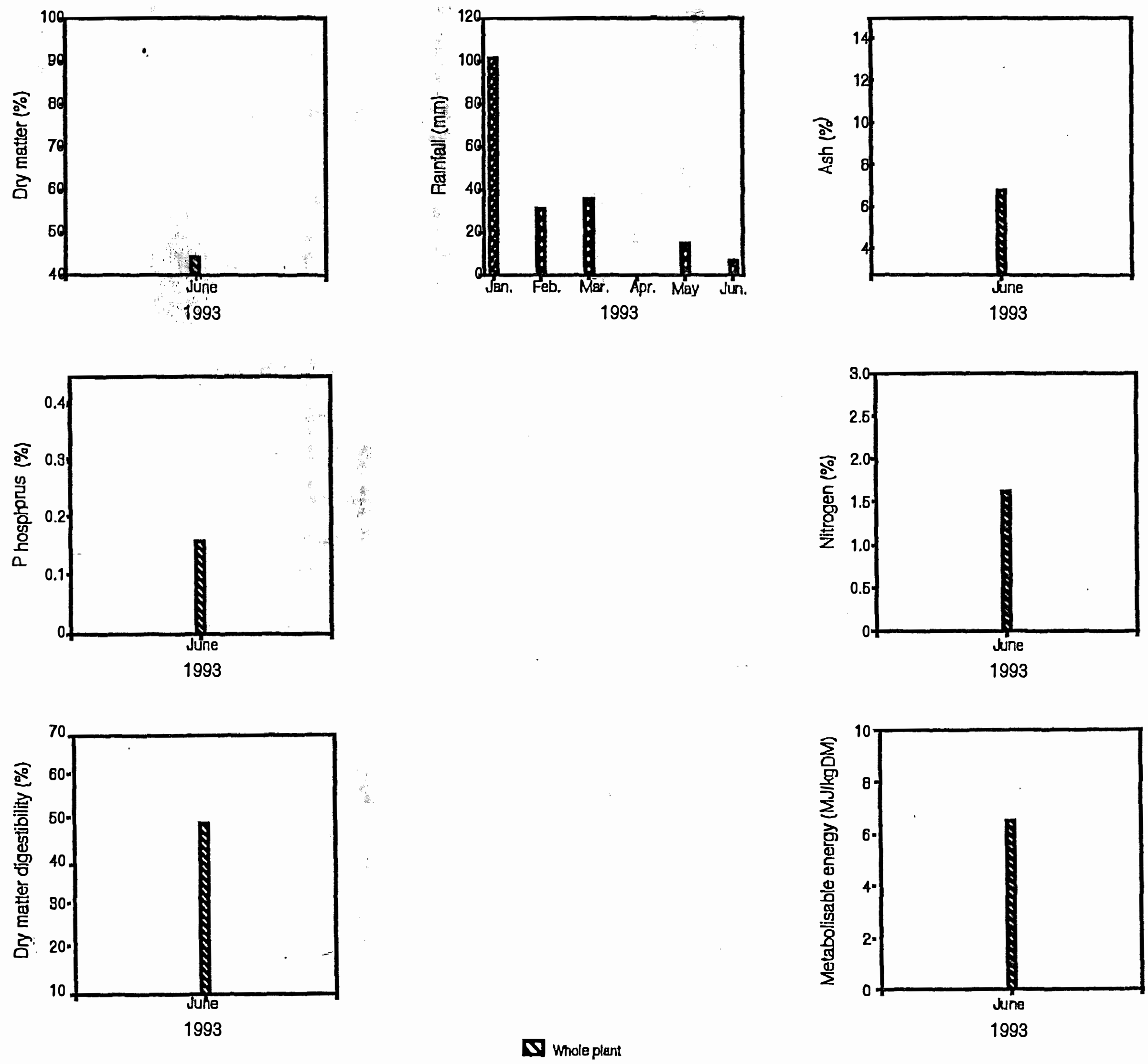

Fig. 30 Biochemical analysis of Siratro plants over time from an improved pasture paddock at a Calliope site in June 1993

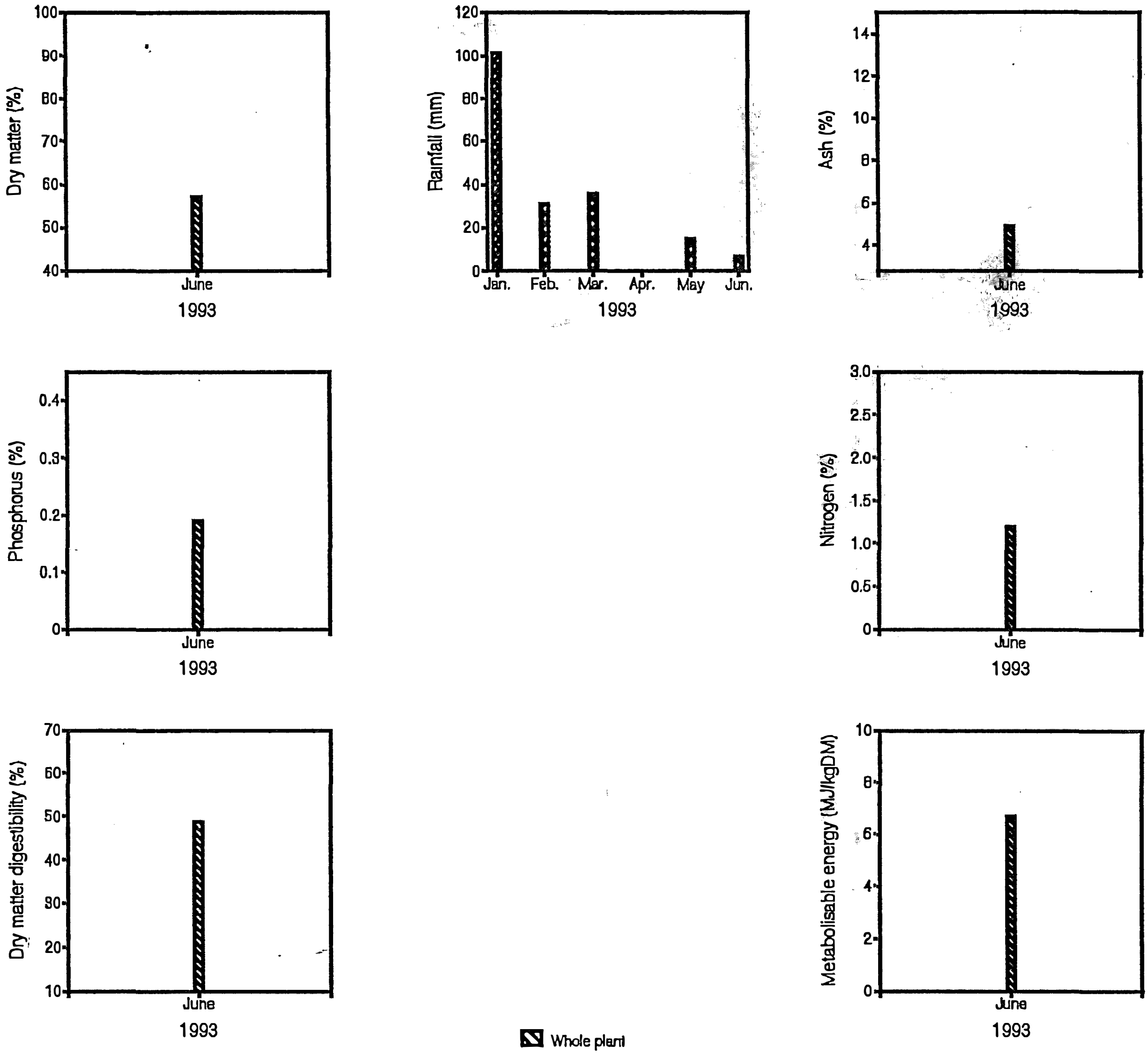

Fig. 31 Biochemical analysis of Wyn cassia plants over time from an improved pasture paddock at a Calliope site in June 1993