PDA NEWS

June 2024

There has been a lot of focus recently on environmental schemes, partly as a response to the now rapidly decreasing Basic Payment (Delinked Payments) and partly in response to the rapidly increasing challenges thrown out by the weather; with some areas of the UK facing their third challenging autumn in five years.

Some of the most popular options amongst the 2023 Sustainable Farming Incentive (SFI) and countryside stewardship (CS) agreements include:

- Herbal leys (SAM 3)
- Multi-species winter cover crops (SAM 2)
- Legume fallow (NUM3)

The PDA News in July last year covered the subject of cover crops and their interaction with potassium cycling, therefore there is no need to further elaborate on this in this newsletter.

The impact of the legume fallow option on nutrient requirements and cycling will to some extent depend on how this option is managed when it comes back into the rotation. If it is left in for the year and residues are left in place, then it is essentially similar to a cover crop, albeit left to grow for longer, however, if any of the material is removed from the field, this is likely to be removing a potentially large quantity of nutrients. The impact this would have on soil levels is difficult to identify due to the variable nature of the option (what mix, how well established, how long it stays in place, tonnage removed etc.). However, this would need to be managed appropriately to avoid a reduction in soil levels over time.

For this newsletter, the two popular options that will be discussed in greater details are the Herbal Leys (SAM3/CSAM3) and the no use of insecticide (IPM4/CIPM4).

Herbal Leys – SAM3 / CSAM3

One of the benefits purported from herbal leys is their ability to significantly improve the nutritional value of grassland when compared with conventional ryegrass and clover swards. The levels of some nutrients, including potassium, calcium, magnesium and sulphur have often been found to be higher in plants such as chicory and plantain, which are often used in such mixes (Dr Emma Davies: IBERS, Aberystwyth University).

Grass offtake values have been researched for decades to provide an understanding of the levels of nutrients removed by a variety of crops grown in different situations. These values are currently collated within the latest version of RB209, the AHDB Nutrient Management Guide. For grass this includes the values of phosphate and potash within various silages and hay, as well as fresh grass. Due to the more variable nature of a herbal ley (which plants are included, what

quantities and how well they establish), gaining the same depth of understanding of uptake and offtake is unlikely to ever be possible. This will create a level of uncertainty in nutrient recommendations for these crops (going forward). Whilst they may have a higher nutritional value, is this due to better scavenging, utilisation or mixture of the two, and will this lead to more rapid soil changes if not identified and managed accordingly.

Table 1: Common species included in herbal leys.

Grasses	Legumes	Herbs
Meadow fescue (F. pratensis)	Birdsfoot trefoil (L. corniculatus)	Chicory (C. intybus)
Perennial ryegrass (L. perenne)	Big trefoil (L. pedunculatus)	Wormwood (A. absinthium)
Italian ryegrass (L. multiflorum)	Alfalfa (M. sativa)	Mugwort (A. vulgaris)
Cocksfoot (D. glomerata)	Sainfoin (O. viciifolia)	Burnet (S. minor)
Timothy (P. pratense)	Sulla (H. coronarium)	Plantain (P. major)
	Red clover (T. pratense)	Sheeps parsley (P. crispum)
	White clover (T. repens)	

When researching the benefits of herbal leys they are often promoted as having the ability to improve 'soil fertility' and therefore lead to 'lower fertiliser costs'. In fact, these comments are taken directly from the DEFRA website, and whilst this may be true for nitrogen due to the proportion of legumes in the mix (assuming they establish successfully of course), this will not be the case for phosphorus, potassium and sulphur.

Clover, a key constituent of herbal ley mixes (Table 1), can require significant amounts of phosphate due to the role this nutrient plays in root development, nutrient uptake and growth. Furthermore, as phosphate is a vital component of the 'energy compounds' within a plant; and as the fixation of atmospheric nitrogen is an energy hungry process; its efficiency is heavily reliant on plants having access to sufficient levels of phosphate.

Table 2 shows the effect of both phosphate and the equally essential sulphur fertiliser application rates on the yield of clover. This shows an increasing trend in yield from applications of each individually and both nutrients together.

Table 2. Effects of rates of sulphur and phosphate fertilisers on clover DM production (t/ha)

P_2O_5 (kg/ha)	SO_3 (kg/ha)					
	0	28	56	112.5	225	Mean
0	2.70	4.81	5.54	5.51	5.77	4.89
45	3.62	5.24	7.29	7.21	7.66	6.20
90	4.26	6.73	7.95	a.43	8.16	7.10
180	3.54	6.30	8.02	8.71	11.18	7.57
Mean	3.77	5.97	7.57	8.02	8.67	6.60

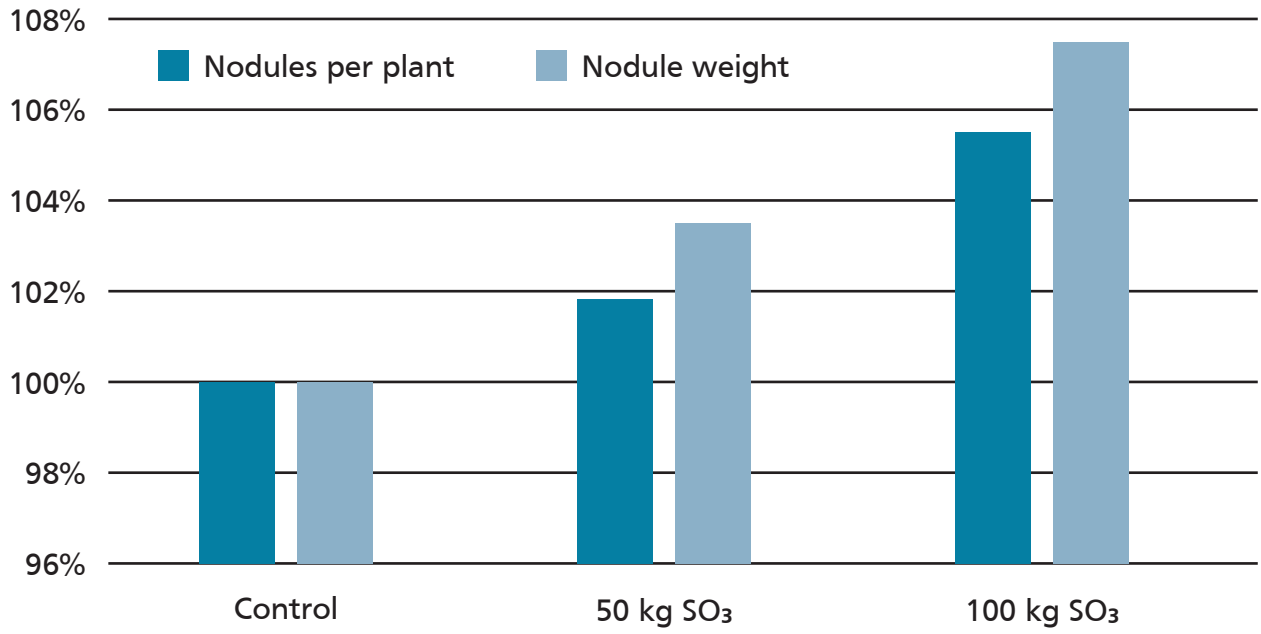
Proceedings of the New Zealand Grassland Association 56: 13-16 (1994)

Potash is very important in the microbiological fixation of nitrogen by root nodules in legumes, therefore is also an important nutrient for herbal leys, especially those which contain a large proportion of legumes.

Clover, along with all legumes, also has a higher requirement for sulphur than grass. Sulphur supply is linked to nitrogen fixation and deficiency results in reduced nodulation, inhibition of nitrogen fixation, and a slowing down of nodule metabolism.

The graph below shows the impact of increasing rates of sulphur on both the amount of nodules per plant and the weight of each nodule, showing a benefit in both incidences to increasing rates of sulphur.

Figure 1. Impact of sulphur application on nodules per plant and nodule weight.



No insecticide - IPM4 / CIPM4

The move towards 'regen farming' over the last few years has driven interest in reducing or eliminating the use of insecticides on farm. This can be seen from the uptake of the IPM4 option, where insecticides are not permitted to be used, with over 430,000ha entered into SFI as of the start of May 2024.

Whilst clearly it would be hoped that these chemical solutions are only ever used appropriately, through monitoring pest thresholds where possible, just stopping using these products without making any additional changes could be a recipe for disaster.

Many virus diseases in the UK affect different crops through transmission by specific aphid species. These viruses can often have significant economic impacts, although not all aphids carry the viruses. However, even without, aphids can also cause wilting, distortion, or stunting of plant shoots.

The role of potassium in mitigating crop damage due to insects is complex. Potassium plays an important physiological role including build-up of resistance to insect pests. Adequate amounts of K have been reported to decrease the incidence of insect damage considerably (Table 3). Plants well supplied with nitrogen and insufficient potassium have soft tissue with little resistance to sucking and chewing pests.

Adequate levels of potassium in plants leads to a reduction in free sugars, lowering the likelihood of attracting insect pests, whilst the tissue yellowing symptoms of potassium deficiency acts as a signal to attract aphids.

A sufficient potassium supply tends to harden plant structures, strengthening cell walls, leading to thicker and harder stems and leaves. This hardening of plant structures improves mechanical resistance to feeding of insects especially sucking insects such as aphids.

Potassium also has a negative impact on the growth and development of sucking pests. In a study on the impact of potassium applications on aphids in oilseed rape, higher plant potassium levels resulted in a decline in occurrence, population levels, rate of population increase and net reproductive rate of aphids Ref: Sarwar, Muhammad & Ahmad, Nazir & Tofique, Muhammad. (2011) Journal of Zoology.

Table 3. Effect of potassium on reduction of damage by aphids

	No. indications			
	Total	Positive	Neutral	Negative
Total	175	115 (66%)	19 (11%)	41 (23%)

IPI Research Topics No.3. Potassium and Plant Health, 1990

Summary

The current version of the sustainable Farming Incentive (SFI) is gaining a lot of interest, and rightly so as farms continue to look for ways to mitigate the reduction in subsidies historically received and to mitigate the risks associated with a changing weather pattern and variable input costs. Changes to farming systems will inevitably follow, as is the purpose of a lot of the options, however these need to be fully understood and managed appropriately to ensure that both the aims of the objectives are met, and to avoid any unintended consequences.

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