Selection & Application of Broadleaf Herbicides

Broadleaf Weeds in Turf

Broadleaf weeds are an ongoing management issue for turf managers throughout Australia. The undesirable growth habit and physical appearance of most broadleaf weeds creates a twofold issue for turf managers. The aesthetic value of a turf sward can be significantly reduced by the presence of broadleaf weeds, particularly during flowering or seeding. Many larger weeds will also create issues with surface uniformity that can impact on ball roll and general surface performance. In addition to the problems relating to turf appearance and performance, broadleaf weeds also tend to create undesirable competition to the turfgrass sward in which they are growing.

The nature of their growth habit often means that sunlight is reduced and turf is smothered. This is additionally challenging in the cooler months when many turf species slow down growth or go dormant, rendering them helpless to the smothering growth of broadleaf weeds. Weeds also tend to compete for soil moisture and nutrient, compromising the resources available to the turf plant.

Selecting Herbicides & Timing Application

Winter broadleaf weeds are generally either: perennials such as creeping oxalis (*Oxalis corniculata*), white clover (*Trifolium repens*) and cats ear (Hypochoeris radicata), or annuals like cape weed (*Arctotheca calendula*), bindii (*Soliva sessilis*) and paleseed plantain (*Plantago virginica*). Both of these lifecycles present their own unique management problems, though the seasonal arrival of winter annuals does at least offer the proactive turf manager the chance to prevent their emergence from occurring provided their timing is correct.

When dealing with perennial weeds other factors must be taken into consideration. Evolution has provided many weeds with seasonal survival mechanisms adapting them perfectly to their natural environment. These include energy storage, specialised seeds, dormancy and general stress resistance. The vast energy reserves possessed by many cool season perennials can make them relatively difficult to control. Energy storage mechanisms of some weeds include tubers, tap roots and rhizomes and can allow established perennial weeds to persist year round and often make chemical control difficult.

Timing is essential when applying poste emergent herbicides for the control of broadleaf weeds. The turf manager must be monitoring the surface for the emergence of annuals, and must be persistent in the control of established perennials. Targeting weeds at the seedling stage is ideal, though this can often be difficult as germination of many species is staggered over a wide temperature range. This means that early applications may control the initial germination, though not the generations that follow throughout the season.

Therefor multiple applications are often required to gain effective control over a weed population with post emergent herbicides. A combined approach of pre and post emergent herbicides is generally the most effective for annuals, though timing preventative applications for perennials is more difficult.

Limiting Factors of Herbicide Efficacy

When targeting well established broadleaf weeds the correct herbicide choice, water volume, application method and surfactant are essential in achieving control. There are many variables that will impact on the performance of a herbicide, most of which can be managed effectively by an experienced turf manager. Key causes of poor herbicidal broadleaf weed control include incorrect choice of product, poor application method (nozzle selection, water volume, spraying speed, etc.), poor quality tank water, and adverse environmental conditions during and after application.

Spray tank water: applicators often give little thought to the quality of water used in a spray solution tank mix. With anywhere from 200 – 800 L of tank water going out over a hectare, there is huge potential for this water to impact on the relatively small volume of herbicide that is included in the solution. Extreme pH, hard water and suspended solids can all impact on herbicide performance. It is essential for the turf manager to know the quality of water being used, and to make the required amendments to create a desirable spray carrier for the specific herbicide. Many sites will use town water for herbicide applications thinking that the quality of the water will be suitable. This is a common misconception as many town waters will have high pH (up to 9.0) or may be hard water. Water testing is a must in understanding spray water quality.

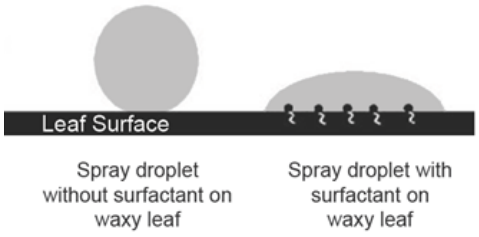
Drift and Volatilisation: the movement of spray droplets away from the target is called spray drift. This occurs regularly during application when wind speed and direction results in droplet movement and drift. Herbicide applications taking place on a windy day and the use of improper nozzles or spray pressure resulting in a finer droplet size often results in drift. Spray drift is a major issue with off target damage. In addition to drift, volatilisation may also occur on calm, warm days when some herbicide droplets vaporise and move up into the atmosphere. Once up off the ground these vapours are able to move vast distances on air currents. Applications of broadleaf herbicides adjacent to garden beds or susceptible turf surfaces can often result in damage of off target species. To reduce spray drift turf managers should take note of wind speed and direction, as well as be aware of any sensitive surroundings that may be impacted upon by potentially toxic spray drift. The use of droplet management products will assist with minimising drift and volatilisation. The selection of a herbicide of low volatility will also reduce the chance of vapour movement. Ester formulations of some herbicides are particularly volatile and prone to vaporising into the atmosphere. Selecting non-ester formulations where possible greatly reduces this risk.

Environmental degradation: rain, irrigation and ultraviolet light following an application of a herbicide can all contribute to degradation of applied chemical. This begins to reduce the concentration of active ingredient applied to the weed, and may limit the amount of herbicide that is actually absorbed by the plant. Timing applications to occur well before a weather event will maximise the amount of active that the target weed is exposed to. To further prolong rain-fastness and to improver herbicide uptake, specialty surfactants can be added to the tank. Products such as Pro-Film 904 that have a broad spectrum of activity in a herbicide application are ideal for improving longevity, reducing degradation and maximising plant uptake by encapsulating the herbicide around the tissue of the target weed.

Droplet activity on target: the behaviour of spray droplets once they reach the target leaf depends on many factors. If the surface of the weed leaf is hairy, waxy, very small or angled to shed water, then the droplets may have trouble making contact with the leaf surface and therefore have reduced efficacy. Droplet contact with the leaf surface is also governed by probability of impact based on droplet size versus target leaf size. Generally speaking large droplets are less likely to hit small target leaf than fine droplets are, and the larger the leaf surface, the greater the chance of a large droplet making contact with it. This does not mean that fine droplets should be used for everything, in fact as a rule of thumb fine droplets should be used for small target leaves, and coarse droplets should be used for larger, broader leaves. If a fine droplet is to be used to target a large leaf then there is a chance that target contact will be limited due to air movement around the leaves. This occurs when a fine droplet is on a trajectory with a large leaf, and having little momentum of its own gets thrown into the air movement around the leaf and away from impact. This is known as spray collection efficiency, and can be overcome through the selection of correct nozzles. A coarser droplet will have more momentum and will continue on its original trajectory towards the target, unaffected by the air current surrounding the leaf.

The key action of surfactants (surface active agents) is reducing the surface tension of water in the pesticide solution. The result of this is an increase in the spreadability of the water, increasing the surface area that the solution can cover and the efficiency that it does so. This is why straight water on an impermeable surface (such as the waxy

How Surfactants Work



cuticle of a plant leaf) will form a bead, rather than spreading outwards. With the addition of a surfactant, water molecules are able to spread outwards as they are rearranged. This allows for increased efficiency in the solutions' contact with the target whether it is turf leaf area, weed plant or an insect pest.

Straight water has a high surface tension as water molecules are strongly attracted to one another. These cohesive forces mean that water molecules are more inwardly attracted to themselves than they are outwardly attracted to molecules in surrounding materials, forming a spherical shape as their energy is concentrated inward. Surfactants have the ability to rearrange the water molecules and tip the balance for the molecules to be less attracted to themselves, and more so to external materials; in essence making water wetter.

Deposition (sticking) agents are adjuvants added to solution to increase the initial amount of pesticide deposited during field application and also to protect the spray residue from loss due to irrigation, rain, dew, leaf abrasion and wind erosion. Deposition agents will emulsify in a water solution and polymerize upon application to ensure spray materials do not migrate from target plant or soil surfaces. Contact insecticides and fungicides are slowly released on the outside of the film for re-distribution and active pest & disease control as the film naturally weathers.

Some adjuvants act to enhance the uptake of systemic pesticides or foliar applied nutrients by improving cuticle penetration. Following application the product polymerises and dries into an elastic film which encapsulates the pesticide particles. Systemic chemicals then move from the film into the plant tissue. As the adjuvant dries rapidly into the waterproof film, it protects systemically translocated chemicals until they can penetrate and enter plant tissue.

Nuturf Australia supplies a comprehensive range of broadleaf herbicides to suit any specific situation. Ask your Territory Manager about the most appropriate herbicide and surfactant for your broadleaf weeds.

SURFACTANT SELECTION GUIDE

	PRODUCT BENEFITS											
		Conditioning						Penetration		Rainfastness		
	Water pH	Hardness	Antifoaming	Compatibility	Droplet Management	Deposition Aid	Spreading	Systemic	Contact	Systemic	Contact	Pattern Indicator
Pro-Film 904*					■	■	■	■		■	■	
Driftex*					■	■	■					
Country Ammonium Sulphate*		■		■								
Activator*			■			■	■	■		■		
LI-700*	■			■	■	■	■	■				
Pulse*							■	■		Minor		
Herbi - Red*												■
Turf Mark*												■

■ Major affect ■ Minor affect ■ The surfactant has an influence on this activity