HOW TO TEST THE EFFECTS OF BROADLEAF P4 ON WATER-HOLDING CAPACITY OF GROWNG MEDIA (SOIL, SAND OR COMPOST), WATERING REQUIREMENTS AND GROWTH OF PLANTS

BROADLEAF P4 has been developed as an aid to horticultural production and landscape planting under wide-ranging conditions. The principal benefits of the polymer are that it improves the water storage capabilities of soils and composts, thereby minimising the risk of drought losses of seedlings and established plants, whether soil or container grown, extends intervals between watering requirements of plants (providing an insurance policy against temporary lack of watering either from irrigation or rainfall) and improves plant growth.

BROADLEAF P4 has many advantages for plant growth, including:

- guarding against drought
- saving water and labour costs in applying irrigation
- improving structure and aeration of growing media and
- increasing nutrient usage efficiency.

Claims are easy to make, so here we outline some ways in which the value of BROADLEAF P4 can be easily tested. It is not possible, of course, to provide all the detail needed for all applications so the suggestions we make here should be taken only as a guideline. AGRICULTURAL POLYMERS INTERNATIONAL LTD. welcomes specific enquiries about testing and practical applications.

1. GERMINATION AND SEEDLING ESTABLISHMENT.

Plants are particularly sensitive to drought during their early development. Serious losses occur each year because of drought conditions at the germination and seedling stages. BROADLEAF P4 can minimise losses at this critical phase. The polymer can be tested in pure sand, pure peat (pH adjusted as necessary) or other media by the following means:

(a) Fill 1 litre, or bigger, pots (*preferably 3 litres* as smaller-volume containers reduce the opportunity for measuring the effects of BROADLEAF P4) with the growing medium, some with BROADLEAF P4 homogeneously mixed (dry) at the recommended rate (treated; see page 3 for recommended rates) and some without (control). Weigh the pots to establish the dry weight.

(b) Bring the pots to container capacity by standing them in water for at least 4 hours and then draining overnight. Note the improvements in texture of the polymer-treated medium. Weigh the pots at container-capacity to establish their water-holding capacity. The container-capacity weight minus the dry weight gives the water-holding capacity of the pots. The difference in container-capacity weight between treated and untreated pots indicates the increase in water-holding capacity provided by the polymer.

(c) Sow equal numbers of seeds into the treated and untreated pots in the normal way, ensuring they are covered with the compost or soil. Place the pots in a warm environment, protected from rainfall, such as a glasshouse.

(d) <u>Do not water further under any circumstances</u>. This is because the test of the polymer is to see how much longer it stores water effectively and in a form available to plants, than the untreated pots. The number of seeds germinated, difference in number of days to wilting and the difference in the amount of growth between treated and untreated pots are therefore the key factors.

(e) Record germination on a daily basis.

(f) When germination is complete and the seedlings have emerged, inspect the pots twice every day (morning and late afternoon). Record the number of days to wilting for each treatment. This will establish by how much BROADLEAF P4 improves germination, seedling establishment and extends intervals between watering. *If it is desired to continue this experiment, either to further demonstrate the effect of the polymer on repeatedly extending watering intervals, or to grow-on the plants for further test purposes* (such as growth comparisons or shelf life assessment), the pots should now be restored to container-capacity as described in (b) above. Then continue to count and record the number of days to first wilting for the treated and untreated pots at each wet-dry cycle. For growing-on

to potting-up stage it will be necessary to provide nutrients such as liquid feed, which can be added to the water used for restoring container capacity (if nutrients have not been added to the pots at commencement of the tests).

(g) Most species will show improved survival and better early growth with BROADLEAF P4 but rapidly-germinating species such as lettuce or radish could be used in the first instance. Others can follow to suit your particular interests. *It should be noted that better early growth also reflects better recovery of nutrients by the plants*, so production efficiency is improved in several ways.

2. GROWING-ON AND FINAL POTTING.

Test work already undertaken has shown reduced watering frequency requirements, improved root growth, better shape, colour and earlier flowering or market/harvest readiness where BROADLEAF P4 has been added to the growing medium. There are a number of ways in which the value of the polymer can be tested, two of which are outlined below.

First Option - To determine the difference in watering intervals and the amount of water required between BROADLEAF P4-treated plants and untreated plants.

(a) Pot up or plant out seedlings, rooted cuttings or young plants in the normal way with BROADLEAF P4-treated and untreated pots/soil plots as detailed in 1.(a), above. Weigh the pots dry and after bringing to container-capacity to establish the differences in water-holding capacity for the treated and control pots, as described in 1.(b) above. Do not use pots of less than 1 litre capacity. For soil plots irrigate initially to field capacity and 2 hours later (during which time the polymer will be hydrating) irrigate again to fully restore field capacity. This will ensure that the polymer and the surrounding soil are both fully charged with water.

(b) Check the pots twice daily. When plants in any pot show first signs of wilting or moisture stress, weigh and record the pot weight, water again to restore container capacity as described in 1.(b), above, weigh and record the container capacity weight and the date of watering. This will give the frequency and the total amounts of water applied for treated and untreated pots. Do this each time from first potting-up until the plants are well established, ensuring drainage of any surplus water can always take place. For soil plots, irrigate to field capacity when early signs of wilting or moisture stress occur. Record the difference in number of days between watering and the early signs of wilting for the polymer treated and the control plants, being sure to water the treated and control plants separately and only when they are separately showing early signs of wilting or moisture stress. Also record the amount of water given to treated and untreated plants at each watering.

If capillary irrigation is used for pot-grown plants instead of the standing-in-water method, allow the capillary bed to dry between each watering, so that the improved capillarity of the growing medium created by the polymer does not cause prolonged over wetting of the root environment. This could happen because the free drainage of surplus water, which P4 normally assists, is prevented by a wet capillary bed and the attendant rising water.

(c) When the plants are well established, water the treated and untreated plants to container or field capacity as described above.

(d) Place the pots in a warm glasshouse, sheltered from rain or irrigation and inspect them twice daily. Record and compare the length of time taken for wilting to occur on treated and untreated plants. Also record and compare the total amount of water given to the treated and untreated plants throughout the experiment. Remove some treated plants from the growing medium very carefully and observe the way in which the roots have attached themselves to the polymer gel particles, enabling the extraction of stored water only as required.

Second Option - To determine the differences in watering intervals, amount of water required, plant growth and growing medium texture between BROADLEAF P4 treated and untreated plants.

(a) Plant up as described for the First Option, watering and recording differences in water-holding capacities, amounts of water applied at each watering and number of days to early wilting between treated and untreated plants, all as described for the First Option.

(b) Note carefully the shape and colour of plants as they develop, the time for flower buds to appear and open and the improved condition of roots. Height, diameter and any other important differences between the treated and untreated plants should be recorded at given intervals to document the benefits of the polymer to plant growth and condition.

(c) Note the open texture of P4-treated soil or compost and the absence of both settlement (compaction) and the tendency to waterlogging that is common in untreated composts, particularly those made of pure peat and when evapo-transpiration rates are low (e.g. winter).

(d) It is essential that adequate provision be made for drainage of surplus water beyond container capacity to avoid waterlogging, as with any standard production system.

(e) Most plant species will show noticeable growth improvements in the presence of BROADLEAF P4. Suitable test plants are numerous. **Geranium, Fuchsia** and **Cineraria** are popular examples. Flowering, foliage and food-crop plants can equally be tested by these or similar methods, but whichever method or variation of method is chosen, the key factor to ensure is that wet/dry cycles between full water-holding capacity (of containers or open ground) and early wilting, take place for both the polymer-treated and the control plants. If this does not happen, a full and fair opportunity for the polymer to demonstrate its advantages of

- Improving growing media structure and water-holding capacity
- Extending intervals between watering,
- Reducing the total amount of irrigation water needed
- Improving plant growth and quality,

cannot properly be demonstrated.

(f) Additional treatments could be included in this option, to assess the effect of BROADLEAF P4 on improving efficiency of nutrient usage. This could be done by reducing fertiliser rates on some of the P4-treated plants by, say 25%, 33% or even 50% and comparing plant size, leaf colour, general condition etc to see if less fertiliser can be used in conjunction with P4 to achieve equal or even better results than normal fertiliser rates without P4.

Recommended Application Rates for BROADLEAF P4

1) *Temperate Climates*
   a) 1* gram of dry granules per litre of growing medium for seeds, cuttings, potting-up etc.
   b) 100* grams per m^2 cultivated in to the top 20 or 30 cms of soil for bedding, shrubs, lettuce etc.
   c) 1.75* grams per litre for hanging baskets and other plant displays exposed to severe drying conditions, plus a 3 cm layer of pre-hydrated gel in the base (under the compost) of the basket or container.

2) *Arid and Semi-Arid Climates*
   Where hot, dry conditions cause very high rates of evapo-transpiration, polymer application rates shown above should be adjusted according to the salinity of the irrigation water as indicated below:

	Electrical Conductivity in mS. cm^{-1}. Approximate Total Dissolved Solids in mg/l in irrigation water in brackets		
	4 (2500)	7 (4500)	16 (10,250)
Increase above rates marked * by:	x2	x3	x4