Chapter C5. Self-mulching clays

PURPOSE OF THIS CHAPTER

To describe the characteristics of self-mulching clays

CHAPTER CONTENTS

- appearance
- topography and vegetation
- land-use limitations and soil problems

ASSOCIATED CHAPTERS

- Part C

SELF-MULCHING CLAYS

The self mulching clays have a uniform heavy clay texture from the surface to deep into the soil profile. The surface soil, when dry, is self mulching, being composed of easily disturbed small aggregates resulting from extensive swelling and shrinking from wetting and drying.

These soils are found in gilgai formations, usually in association with transitional red brown earths. The self-mulching clay soils occur as the mound or puff in gilgai formations, while in the lower areas between the mounds transitional red brown earths are usually found. The proportion of the mound compared with the shelf in gilgais varies. The proportion of the mound in a gilgai formation therefore influences the land-use options and management of a particular area. Areas with more than 50% mound as a proportion of the total area are usually considered to be self-mulching soils.

APPEARANCE

The colour of the self-mulching clay soils ranges from reddish brown to grey. This colour may tend to be more yellow with depth. Small white nodules of lime (calcium carbonate) may be seen on, or just under, the surface of these soils to depth.

When dry, the surface of these soils will have a soft feel when you walk over it, because the soil structure is excellent. This property makes these soils very easy to cultivate when dry. A shovel can be pushed into the surface of these soils with comparatively little effort.

CRACKING CLAYS

Many of the self-mulching soils in the vegetable-growing areas of the MIA are cracking clays. Cracking clays are dark (grey, reddish and black) soils, containing high amounts of clay (more than 50%), that crack on drying and swell on wetting throughout the profile and, most importantly, right to the surface. During summer, cracks of a few to tens of millimetres wide appear at the surface, but swell closed after the first winter rains. Many of these soils form a shallow (less than 100 mm thick) surface ‘mulch’ layer of small (1 to 2 mm diameter) aggregates during cycles of wetting and drying. After rain or irrigation, this ‘mulch’ may disappear as the aggregates swell into each other.

These soils are seldom used for the production of perennial crops, but are used for annual horticultural row crops such as tomatoes, cucurbits and sweet corn. They affect root growth in several ways. Young, perennial crops may be slow to establish, and high mortality may be observed in the first year after planting. Annual crops may perform well in the first year, but performance rapidly declines in subsequent years. The reasons for these responses are not well understood, and management systems that avoid rapid soil structure decline are not available. Some of the factors that are responsible for poor crop performance are:

- shallow root zones may be 'waterlogged' (roots suffer extreme lack of aeration) during winter and spring
- roots may be damaged by cracking of soil on drying in early summer
- young plant roots may have insufficient root–soil contact as a result of large cracks developing in the shallow root zone in summer, and water uptake may be sufficiently impaired to affect plant growth
- water availability may generally be limited because of the high clay content and the propensity of these soils to compact themselves (coalesce) even when not trafficked.

TOPOGRAPHY AND ASSOCIATED VEGETATION

Self-mulching clays occur as the mound or 'puff' in gilgai complexes. The vegetation most likely to be found on areas of self-mulching clay is:

- boree
- black box.

LAND USE LIMITATIONS AND SOIL PROBLEMS

The well structured self-mulching clays have a good mix of transmission pores (which allow water and air to move through the soil) and storage pores (which store water for use by plants); therefore, plant growth on these soils is usually very good compared with that on the other soil groups.

Self-mulching soils can withstand comparatively frequent cultivation without changes to structure. However, this may not be the case if they are cultivated while the soil is too wet. Tillage or traffic from machinery or animals in moist conditions is likely to cause compaction in these soils. Yield losses due to compaction may increase slowly over time. However, losses due to compaction will be large, and relatively sudden if the soil is cultivated when it is too moist. It is therefore important to make an assessment of soil moisture to the depth of cultivation before proceeding with the operation.

The effects of compaction from traffic can be largely eliminated if traffic is confined to furrows, as is the case in permanent raised bed systems of crop production. Permanent raised beds have other advantages.

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See Chapter D7 for more information on permanent raised beds.

OTHER SOILS

Vegetables are grown on many more soil types than those discussed in this Part of the manual. An example is the kraznozems, which are basalt-derived, well structured loamy soils high in organic matter used for potato production around Robertson in the Southern Highlands. However, the majority of vegetables are grown on the soil types discussed.