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worthy, John Garfield; Grindrod, Sydney; Lower, Harold Stewart Farnham; Mills, Dorothy Nell; Mountain, Valerie Luella; Shaw, Alice Mary Stockdale; Shaw, Kate Hambly, B.A.; Thompson, Jean Fleming.

French, Third Course.—Passed with Credit (in order of merit)—Child, Marie Beatrice; David, Daniel Arthur. Passed (in alphabetical order)—Harris, Sophie Dora; Kechne, Marjory Evelyn.

German, First Course.—Passed with credit—Auricht, Johannes Edwin; Meier, Wilhelm Erich; passed (in alphebatical order)—Brauer, Edwin Harold; Cole, Reginald William; Crampton, Mary Hope St. Clair, B.A.; Liebing, Dora.

German, Second Course.—Passed with credit (in order of merit)—Ohlstrom, Leonore Annie; Meier, Wilhelm Erich; Auricht, Johannes Edwin; Schneider, Elsa Louise; passed—Habich, Carl Gerhard.

Modern History, First Course.—Passed with credit (in order of merit)—Dawson, David Lancelot; Bleby, Dorothy Aileen. Passed (in alphabetical order)—Allen, Henry Joshua; Arthur, Lawrie Edyvean; Bayly, Geoffrey Hamlyn; Carroll, Mary Philomena; Davies, Natalia; Dixon, Lyall Douglas; Fong, Avenal Essie; Fyfe, Elspeth Alison; McEvoy, Aloysius John; Mann, Margaret Noble; Munn, Phyllis Mary; Richardson, Roslyn Fenshaw; Roesler, Dorothy Lorna; Sweeney, Mary Ryan; Williams, Zena Vera.

Modern History, Second Course.—Passed with credit (in order of merit)—Watt, Fanny Eileen; Pittner, Eric Norman. Passed (in alphabetical order)—Byrne, Mildred Emily; Harrison, Walter; Scrutton, Thomas Osmond.

Modern History, Third Course (European).—Passed with credit—Reynolds, John Heywood. Passed (in alphabetical order)—Coats, Claude Hampson; Lushey, Harold Merton, B.A.; Reynolds, Beatrice Mary Heywood, B.A.; Richards, Archibald Charles, B.A.

Recommended for the Tinline Scholarship.—Reynolds, John Heywood.

Economics, First Course.—Passed with credit (in order of merit)—Ballantye, Elsie Ray and Trengove, Rosalie Irene, equal; Jenkin, Mabel Gertrude; Gill, Clarence William Cecil; Butler, Francis James; Caldicott, Emma Victoria and Fitzgerald, Bartholomew John, equal; Hosking, Lochee Maude; Symons, Clifford Thomas; Morgan, Olwen Esther. Passed (in alphabetical order)—Abotomey, Olive Wanda; Allen, Henry Joshua; Hampton, Albert William; Bayne, Lois Heath; Bayne, Melva Elsie; Bierwirth, Ronald Callanan; Blizard, John Temple; Bray, Theodore Charles; Campbell, Robert; Davis, John Godfrey; Dryvesyde, Beresford O'Neill Wilson; Edgerley, Mary Harrison, Faulkner, Irene Winifred; Flower, Ernest Frank; Gooding, Flora May; Grave, Marion Rose; Habich, Carl Gerhard; Hauser, Frederick Herbert; Hilton, Arthur Robert, B.A.; Howell, William Ewart; McKinnon, Robert Campbell; Osman, Marjorie Hanson; Page, Frederick Edwin; Pentelow, Edith May; Scoble, Sidney John; Sexton, Edgar Raymond; Shaw, John Robert Stockdale; Skitch, Edith Mary Lee; Sweeney, Mary Ryan; Temby, Clarence Muriel Richenda; Webb, Rita Gwendoline; Whitham, Kathleen West; Zanker, Dorothy May.

Economics, Second Course (15).—Passed with credit (in order of merit)—Penny, Hubert Harry, B.A.; O'Connell, William Bernard; Fordham, Juanita Horwood; Johnstone, Bessie Ilma. Passed (in alphabetical order)—Barclay, Julian Magarey; Bray, Alan Claude; Coombe, Mary Minetta; Evans, Eric Laurence; Hackett, Margaret Emmeline; Mitchell, Annie Mora; Parrington, John Samuel; Paull, Alec Gordon, B.Sc.; Pearson, Leslie Norman; Vickery, Frederick Arthur; Wade, Walter Ernest.

Psychology.—Passed with credit (in order of merit)—Tymons, Catherine Honora; Orrock, Ena Beatrice Faith; Parker, Mina Evelyn; Coats, Claude Hampson, and Greet, Norman George Frank (equal); Vickery, Frederick Arthur, and Dorsch, Magdalene Hedwig (equal). Passed (in alphabetical order)—Allen, Leonard Nicholls; Anderson, Isabella; Auricht, Johannes Edwin; Batchelor, Ruth Olive, Burton, Hilda Hannah; Caldicott, Emma Victoria; Child, Marie Beatrice; Collins, Charles Vincent; Crossing, Ada; Dickinson, Edith Grace; Foster, Winifred; Fyfe, Dorothy Mary; Gartrell, Minnie Henrietta Foxwell; Howard, Ephrem; Jeffs, Kathleen Ellinor; Kean, Eileen Margaret; Kingston, Edith Elizabeth; Kingston, Frederick Arthur; Logan, Ernest Albert William; McDonald, Gilbert Sherman; Magor, Clifford James; Mara, Margarita Anna Flora; Michelmore, Roland Symons; Mulrden, Hector Raymond; O'Connell, William Barnard; Painter, Rowland George; Raffelt, Helene. A.C.U.A.; Rogers, Irene Blanche; Shaw, John Robert Stockdale; Tuckwell, Kenelm Sinclair; Wade, Walter Ernest.

Logic.—Passed with credit (in order of merit)—Symons, Lloyd Alfred Grigg; Ashton, Walter Ray; Greet, Norman George Frank. Passed (in alphabetical order)—Barwell, Mary Gilbert; Oyster, Thomas; Harrison, Walter; Klose, Oscar Herbert Wilhelm; Logan, Ernest Albert William McDonald, Gilbert Sherman; Maschmedt, Zilla Daisy; Mitchell, Annie Nora; Parsons, Edward Clarence.

Recommended for the Roby Fletcher Prize.—Greet, Norman George Frank.

Ethics.—Passed with credit (in order of merit)—Adams, Reginald Keith Sorby, B.A.; Penny, Hubert Harry, B.A., and Watt, Fanny Eileen (equal). Passed (in alphabetical order)—Bowler, Mary; Cochrane, William Henry Albert; Dixon, Lyall Douglas; Harrison, Walter; Holden, Ethel; Lang, Philip Roy, B.A.; McDonald, Percy William; Rendell, Alan, Dip. Econ.; Woodard, Charles Ernest.

Philosophy, Part II.—Passed with credit (in order of merit)—Crampton, Mary Hope St. Clair, B.A.; Adams, Reginald Keith Sorby, B.A.; Badger, Colin Hibert. Passed (in alphabetical order)—Auricht, Johannes Edwin; Campbell, Robert; Dixon, Lyall Douglas; Harvey, Frederick George Washington; Messent, Esther Mary; Painter, Rowland George.

Education.—Passed with credit (in order of merit)—Coats, Claude Hampson, Nicholas, Thelma Forsaith, and Slade, Eleanor May (equal); Daddow, Henry Howard, Dickinson, Edith Grace, and Watkinson, Mavis Daphne (equal); Edgeloe, Victor Allen; Verco, Caroline Everard Lamey; Charles Sydney, and Springbett, Doris Victoria Fawn (equal); Morgan, Olwen Esther; Fong, Avenal Essie, and Lade, Phyllis Evelyn, B.A. (equal); Child, Marie Beatrice, Mills, Dorothy Nell, and Walker, Mildred (equal); Crane, Greta Ruby, and Haines, Ethel May (equal); Paterson, Alfred Harold, Garrett, Dorothea Helene, and Klaffer, Ludwig Edward (equal); Benger, Dulcie Fay, Colebatch, Hubert Clarence, Hughes, Evelyn Conrad, Jones, Elizabeth May, Orrock, Ena Beatrice Faith, Smith, Eileen Milton, and Tapp, Mabel Florence Barbara (equal). Passed (in alphabetical order)—Adams, Gladys Gertrude; Allen, Clarence Henry John; Baker, Marjorie May Scott; Bourke, Elma Marie; Brauer, Erle Wilfred; Bray, Alan Claude; Brooks, Charles Albert; Butcher, Edward Allan; Chrystal, Marjorie Emma; Davis, Frederick Harry; Dawson, David Lancelot; Deer, Eyson John Cullimore; Dempster, Donald; Dilena, Ernest William; Duley, Elsie Muriel; Francis, Mary Lovell; Gerke, Pauline Mary; Gibbons, Phyllis Annie; Haines, Norman Lindsay; Hart, Marie Omer; Hart, Milly; Hecker, Iris Muriel; Hosking, Henry Arthur; Jenner, Doris Ethel; Jolly, Robert Leslie; Kelly, Brigid Mary; Kelly, Ellen; Kohler, Wilfred Horace; Lamshed, Albert Saville; LeMaistre, Ray Mauger; Lewis, Edith Averil; Lower, Harold Stewart Farnham; McCabe, Sheila Marie; McDowell, Kathleen Mary; May, Dorothy Mary; Miller, Margaret Una; Moore, Hector Wolfram; Moore, Sheila Marie Antoinette; Morriss, Dorothy May; Moss, Dulcie; Moyle, Cuthbert James Chittleborough; Moyle, William George Chittleborough; Naughton, Rosina Mary; Nicholson, Annie; Payne, George Basil; Phillips, Marjorie Clara; Rosewall, Dora; Schneider, Blanche Evelyn; Schubert, Zelma Marguerite; Smith, Charles Samuel; Smith, David Carswell; Smith, Dulcie Clara; Sprunan, Bridget Catherine; Standen, Douglas Milton; Stone, Constance Claire; Thomas, Elvira Beatrice; Travers, Nora; Trenorden, James Henry; Wall, Thomas Welbourn; Wauchope, Kathleen Amey; Wilkins, Ada Dorothy Marion; Wilkins, Ernest John; Williams, Dorothy Emma; Williams, Phillip Glenly; Woolford, Gordon William Davison; Yeates, Gweneth Irene.

DIPLOMA IN EDUCATION.

Education.—Passed with credit—Stephens, Eric Goyne, B.Sc.

Psychology.—Passed with credit—Westgarth, Walter Tebble, B.A. Passed—Flower, Clifford Horace Kenneth Dunn, B.Sc.

Hygiene.—Passed with credit—Caust, Leslie George William, B.A. Passed (in alphabetical order)—Bartholomaeus, Edmund Stanley; Johncock, Ernest Harry, M.A.; Leach; William Valentine, M.A.; Lower, Harold Stewart Farnham; Paull, Alec Gordon, B.Sc.; Stephens, Eric Goyne, B.Sc.; Westgarth, Walter Tebble, B.A.

Educational Psychology.—Passed with credit—None. Passed (in alphabetical order)—Edwards, Leslie; Griggs, Clarence Middleton, B.Sc.; Klose, Alfred Emil Johannes, B.A.; Mutton, Henry Elwin Howard, M.A.; Westgarth, Walter Tebble, B.A.

Principles of Primary School Method.—Passed with credit—None. Passed (in alphabetical order)—Bartholomaeus, Edmund Stanley; McConnon, James; Westgarth, Walter Tebble, B.A. Thesis—None passed.

DIPLOMA IN SECONDARY EDUCATION.

Principles of Secondary Education.—Passed with credit (in order of merit)—Johncock, Ernest Harry, M.A., and Leach, William Valentine, M.A. (equal); Pyne, Maurice Ignatius, B.A. Passed—Griggs, Clarence Middleton, B.Sc.

DIPLOMA IN ECONOMICS AND POLITICAL SCIENCE.

Economics and Commercial History.—Passed with credit—None. Passed (in alphabetical order)—Doecke, Heinrich Albert; Morris, Lyndall Erica, B.A.

Advanced Economics.—Passed with credit—None. Passed (in alphabetical order)—Biddle, John Parr Harding, A.C.U.A.; Judd, Percival Richard Henry.

British Constitutional History.—Passed with credit—None. Passed—Judd, Percival Richard Henry.

Political Science.—Passed with credit—None. Passed—James, William John Abraham.

FACULTY OF LAW.

Greek (I) First Course.—Passed with credit—Teusner, Berthold Herbert. Recommended for the Barr Smith Prize—Teusner, Berthold Herbert.

Latin, First Course.—Passed with credit (in order of merit)—Ewens, John Qualtrough; Shoobridge, Ivan. Passed (in alphabetical order)—Chapman, Frank Hewett; Cummins, Alice Mary; Forgan, Frederick Robert; Harry, Romilly Carveth; Teusner, Berthold Herbert; Wynes, William Anstey.

English Language and Literature, First Course.—Passed with credit—None. Passed (in alphabetical order)—Irwin, Robert Newenham; Pick, Sidney.

English Language and Literature, Second Course.—Passed with credit—None. Passed—Cornish, Jack Rodolph; Glynn, Denis McMahon.

French, First Course.—Passed with credit—None. Passed—Wynes, William Anstey.

French, Second Course.—Passed with credit—None. Passed—Wynes, William Anstey.

History, First Course.—None passed.

Economics, First Course.—Passed with credit—McEntee, Kevin Vincent. Passed (in alphabetical order)—Michell, John Elsome; Power, Edward Joseph.

Psychology.—None passed.

Logic.—None passed.

ADV. 24·11·26

UNIVERSITY OF ADELAIDE.

EXAMINATION RESULTS, OCTOBER, 1926.

PASS LIST.

Faculty of Music.

Final composition for Mus. Bac. degree—Scarlett, Robert Dalley.

ORDINARY EXAMINATION FOR THE DEGREE OF BACHELOR OF MUSIC.

First year—Passed with credit, none; passed, Ekers, Theodora Allman.

Second year—Passed with credit, Burnard, David Alexander; passed, none.

ADV. 29·11·26

The faculties and boards of the University have reported to the council that the following have been appointed deans or chairmen for 1927:—Faculty of arts, Professor W. K. Hancock; faculty of science, Professor T. G. B. Osborn; faculty of medicine, Dr. W. Ray; faculty of dentistry, Sir Joseph Verco; board of commercial studies, Mr. S. Russell Booth; library committee, Professor Wilton; joint committee for tutorial classes, Professor J. McKellar Stewart.

ADV. 29.11.26

The board of examiners has reported favorably to the council of the University upon the thesis presented by Mr. L. K. Ward, B.A., B.E., for the doctor of science degree. The subject of the thesis was "The geology of Central Australia." The board of examiners has also reported favorably on the work presented by Mr. T. A. Le Messurier for the degree of M.Sc. The degrees will be conferred at the annual commemoration next month.

ADV. 29.11.26

THE "ALKALI" SOIL PROBLEM.

PART I.

Mr. Eric S. West, Research Officer at the Commonwealth Citrus Research Station, Griffith, writes in the "Agricultural Gazette of New South Wales:"—

"Alkali" troubles are as old as irrigation itself. Within recent years much scientific research has been directed towards the solving of the problem, especially in the western State of America, India, and Egypt.

The term "alkali" to designate the condition of a soil brought about by the excessive accumulation of soluble salts is unfortunate. Chemically, alkalies are a very definite class of compounds, which are caustic, and generally have properties opposed to acids, which they neutralise, forming salts. True alkalies never occur in the soil. The term "salt," frequently employed in Australia, is to be preferred, as all the injurious substances occurring in the so-called "alkali" soils are true salts in the strict chemical sense of the word.

The Causes of Salt Injury.

Osmotic Phenomena.—Salts may be harmful in several ways, but the injury due to the phenomena of osmotic pressure is the most harmful. When a fresh seedling is taken from the soil its roots, stem, and leaves are crisp and more or less rigid, owing to the fact that they are full of cell sap, or, in other words, they are turgid. If, however, the seedling is thrown on to a hot pavement it will soon lose water and wilt. The same result can be brought about by placing the seedling in a brine solution. A fresh, crisp seedling placed in a solution of salt will soon become flaccid, the cause in both cases being the removal of water from the seedling. When a seedling is growing normally in the soil, the concentration of its cell sap is greater than that of the soil water surrounding its roots, and, because of this water, tends to pass into the roots, and thus keeps the plant turgid. If, however, the concentration of the water suronunding the roots is greater than that of the cell sap, as is the case in a salt soil, or when a seedling is placed in a solution of brine, water passes out of the plant into the surrounding solution and the plant wilts. In this case, we say that the osmotic pressure of the solution surrounding the plant is greater than that of the cell sap.

Osmotic pressure may be explained in another way. When any solid, such as salt or sugar, dissolves in water, minute particles, known as molecules, leave the solid to enter the fluid, and the magnitude of the osmotic pressure depends entirely on the number of molecules present, regardless of their kind (whether salt or sugar molecules). The injury of salts due to osmotic pressure is dependent on the magnitude of the pressure, and not on the kinds of salt present.

Plant Poisons.—Apart from the injury, due partly to osmotic phenomena, many salts, such as magnesium salts, are actual plant posions when present in excessive amounts. Then, again, certain salts, such as sodium carbonate (washing soda), although actually not true alkalies in the strict chemical sense of the word, form an alkali when dissolved in water, and thus, for all practical purposes, may be considered as such. Both a high soil acidity and a high soil alkalinity are poisonous to the plant, but the latter is the more serious. For this reason, therefore, sodium carbonate is very poisonous to plant growth, being, in fact, the most toxic of all commonly occurring salts. Apart from its effect on the plant, this salt, in common with true alkalies, is very injurious, because of its action on the physical condition of the soil. If a little soil is shaken up in water a muddy supension is obtained; on addition of an acid or salt (such as gypsum) it will be noted that the particles of clay run together, forming little aggregates which soon sink, leaving a clear liquid. It was stated before that the properties of alkalies were opposed to those of acids, and in this respect their action on the soil is no exception, for the addition of an alkali to the clarified liquid will cause the clay particles to again separate, and when shaken the water will become muddy and the particles will not settle.

In a soil of good tilth the clay particles are grouped together in aggregates, and the soil is more or less porous, which explains the action of gypsum in the soil, the gypsum causing the clay particles to form aggregates, thus making the soil more open. "Alkalies," such as sodium carbonate, however, have the opposite effect—puddling the soil, causing it to decrease in volume and become almost impervious to water.

Besides having this physical effect, "alkali" dissolves out the organic matter of the soil, giving the soil a black color; hence, when sodium carbonate is present one observes sunken black depressions almost impervious to water, and absolutely sterile.

Salts Commonly Present.

Generally speaking, the chief salts present in salt soils are the chlorides, carbonates, bi-carbonates, and sulphates of soda, lime and magnesia.

Sodium chloride, or common salt, is almost universally present, and usually predominates. One would expect this to the case, as this is the chief salt present in the ocean and inland salt lakes, the salt in these cases having been derived, of course, from the continual leaching of the land since the world began.

Sodium sulphate is also generally present, but usually to a less extent than the former. In parts of Wyoming and Colorado, U.S.A., it predominates, sometimes to the exclusion of all other salts. It is efflorescent, i.e., it has the property of drying out or giving up its moisture to the atmosphere; thus if one end of a wick is placed in a solution of this salt, the other end will very soon become coated with a thick deposit of the crystalline material. On account of this property it coats the clods of soil of salt lands, and is mainly responsible for the white efflorescence often observed. It is not nearly so toxic as sodium chloride, being, in fact, the least toxic of all injurious salts. In Wyoming and Colorado some soils are covered with such a thick deposit of this salt as almost to resemble snow, and yet they are capable of growing good crops, the reason being that most of the salt present is sodium sulphate, which, while coating the clods and making the soil look very saline, is actually not very toxic.

The chlorides of lime and magnesia are deliquescent, that is, they have the property of absorbing water from the atmosphere (contrast sodium sulphate). If a lump of dry calcium chloride is left exposed to the air it will soon absorb so much water that it dissolves in the water so absorbed, and instead of a dry lump we get a "blob" of liquid. It is because of these salts that many salt lands constantly remain damp, a very familiar phenomenon.

Magnesium sulphate (Epsom salts) is also generally present to a certain extent and is fairly toxic.

Sodium carbonate (washing soda) is the most toxic of all salts commonly found in the soil, on account of its alkaline properties, and when present gives rise to "black alkali." The bi-carbonate of soda (cooking soda) is very similar in its properties, but it is not quite so harmful. Fortunately, large amounts of carbonates of soda are rarely present in Australian soil, and black alkali is not, therefore, very common.

The Complexity of the Problem.

The question of the relative tolerance of different plants to salt lands is exceedingly complex, owing to the number of variable factors concerned. In the first place, the salts vary among themselves in their toxicity, sodium carbonate often proving to be about five times more toxic than any of the others, while sodium sulphate is only slightly toxic, and calcium sulphate (gypsum), being only sparingly soluble, is probably never toxic. An approximate order of toxicity of common soil salts is as follows:—Sodium carbonate, sodium bi-carbonate, magnesium chloride, magnesium sulphate, sodium chloride, calcium chloride, sodium sulphate, and calcium sulphate. It is to be noticed that the soluble carbonates and bi-carbonates are the most objectionable, followed by chlorides and sulphates. Magnesium salts are more toxic than corresponding sodium salts, followed by the salts of lime.

The problem is further complicated by a peculiar phenomenon known as the "antagonism of ions." Magnesium chloride is very toxic when present as a pure solution, but the addition of a small quantity of calcium chloride (itself toxic) vastly increases the tolerance of plants to the former. In the same way magnesium antagonises the effect of calcium, and sodium of either calcium or magnesium, and in general the presence of one salt antagonises the toxic effect of another. If, therefore, we have three vessels of water of equal capacity, and in one dissolve enough calcium chloride, and in the second enough magnesium chloride to prevent the growth of a wheat seedling, and in the third vessel dissolve both salts in the quantities used in the other vessels, instead of being twice as toxic, as one would expect, wheat seedlings would grow quite normally in it.

It is thus seen that the toxicity of saline soils varies not only with the kinds of salt present, but also with their relative proportions, of which an infinite number of combinations are possible.

The class of soil is a further complication, for, generally speaking, plants are more tolerant of salts in heavy classes of soils, such as clays and clay loams or soils rich in organic matter, than in the lighter types, such as sands and sandy loams, and this for several reasons. In the first place the first mentioned classes of soil require a higher water content for plant growth than the latter; therefore, with the same quantity of salt present, the concentration of the soil solution is less, and consequently not so toxic. The problem is not so simple as this, however, because if the amount of salt present in the two classes of soil is so adjusted that the concentration of the soil solutions are the same, it is found that even then the salt is less toxic in the heavy soils or soils rich in organic matter than in the lighter classes of soil; in fact, plants will not tolerate the same concentration of salt in a water culture free of solid material as they will when solid material present, even if the latter be pure quartz sand. Apparently the presence of solid particles has an important influence, and not only is this so, but the size of the solid particles is important; the finer the particles the more tolerant the plant, which accounts for the greater injury to plants in sandy than in heavy soils or those rich in organic matter. The question is bound up in the absorption phenomena of colloids, clay, and humus soils, having a high colloid content.

Although, generally speaking, salts are more toxic in light than in heavy soils, in the case of sodium carbonate (black alkali) the reverse is the case, owing to the bad effect of this salt on the physical condition of the soil.

Salt may be concentrated in certain layers, and this is then more harmful than when evenly distributed throughout the soil, as in these layers a very concen-