10 Nov 76

Seminar - Genetics 690 - 4:10 PM - 131 Ross

PHYTAHEMAGGLUTININS AND SPECIES DIFFERENCES: Wilmer J. Miller

Suggested References:

Boyd, W. C. 1962 Introduction to Immunochemical Specificity
Interscience Publishers, John Wiley and Sons NY Chapters 5 and 6.

Gold, E. R. and P. Balding 1975 Receptor-specific proteins:
Plant and Animal Lectins
Excerpta Medica, Amsterdam

Cohen, E. Ed. 1974 Biomedical Perspectives of Agglutinins of Invertebrate
and Plant Origins. Ann. NYAS 234: 1-412

A Sample list of plant species and the human cell types they pick out:

A	Lima bean* *Vicia cracca*
A_1	*Coronilla varia* *Dolichos biflorus**
B_1	*Evonymus alatus* " *sacrosancta*
B	*Bandeiraea simplicifolia*
A+B	*Sophora japonica*
B+H	*Magnifera indica*
A+H	*Dictyota bartayresii* (brown algae)
H	*Ulex europaeus** (common gorse) *Laccaria laccata* (fungus) *Dermatocarpon miniatum* (lichen)
I	*Helvella sulcata*
N	*Vicia graminea* *Bauhinia purpurea**
M	*Iberis amara*
A+N!	*Molucella laevis*
Rh+?	*Clerodendron trichotomum*
Tn	*Salvia aurea* *Salvia sclarea* plus several

* = a preferred source

TITER OF SOME ABSORBED LECTINS WITH AVIAN SPECIES AND HYBRIDS

Lectin	Pisum sativum		Phaseolus coccineus			Glycine max		Phaseolus vulgaris		Ricinus communis			Datura meteloides		
	Alaska Pea		Scarlet runner bean			Soybean		Kidney bean		Castor bean			Moonflower		
Chemical Specificity →	D-man					D-GalNac				β-D-Gal					
Number of absorbing tubes →	-	6	16	13	9	½	3	7 or 9	9	12	19	19	(15)	NCA 11	6
Absorbing species →	Unab-sorbed	Turkey	Pig 1	Pig 2	Human AB	Turkey	Pig 3	Human/Pig 0 2	Human AB	Human 0	Pig	Turkey	Rabbit	Human 0	She
Test Cells															
Anas platyrhynchos Mallard	4*		3	0	6		0	2	4		2	4	1	2	
F_1 M/M	0		5	0	5		0	4	7		5	3	2	3	
Cairina moschata Muscovy	0	0	6	0	5,6	0	0	6	7		5	0,3	3	3	
Columba livia Pigeon	0	0	5	0	6	0,2	0,2	7	5	0	3,4,5	1,2,3,4	3	2	4
F_1 Pgn/Rn	0	0	0,2,5	0	4	4	4	6	6	0	0,4	2,3	0		4
Streptopelia risoria Ringneck	0	0	0	0	0,2,3	4,5	4,5	0	0,2	3	0	3,4,5	0	0	0
Zenaidura macroura Mourning Dove	5	3	6		4	WO, E3	0	6	6	0	5	0	3	2,3	4
F_1 Md/Rn	3	0			5	3	3	5	6	0		2	3	2	
S. humilis Dwarf turtle dove	0	0	2	0	3	4	0,3,4	1,6	4		0,1	3			0,2
F_1 Dtd/Rn	0	0	0	0	2,3	5	3	0,3	2	3	0				1,3
S. chinensis Pearlneck	2	0	0	0				2	4		0	0			1
F_1 PN/Rn	2	0	0	0		3	3	0,2	3		0	0			1
S. bitorquata Phil. turtle dove		0	0		3	3	3	3	3		0				2
F_1 Phil/Rn		0	0		4	3	3	1	3		0				2

*titer in number of quadrupling dilutions

Strongest Phytohemagglutinins: number of quadrupling titers with red cells

Chemical Specificity →	β-D-Gal		a-D-man a-D-Glc	β-D-Galp		
	Ricinus communis	Datura meteloides	Canavalia ensiformis	Phaseolus vulgaris	Phaseolus coccineus	Maackia amurensis
Species	castor bean	moonflower	Jackbean	round wax kidney bean	scarlet runner bean	
S. chinensis	6	7	7	7	8	9
F_1 ch/ri	6	6	8	7	8	8
F_1 ch/se	5	6	8	7	8	8
S. senegalensis	5	6	7	6	8	8
S. bitorquata	6	6	7	6	8	7
F_1 bit/ri	6	5	7	6	8	7
F_1 cap/se	7	6	7	7	8	8
F_1 semit/ri	6	6	7	6	8	7
S. humilis	7	6	8	8	8	7
F_1 hu/ri	6	6	7	6	8	6
S. risoria P+	7	6	8	7	10	6
S. risoria P-//+	7	6	8	7	7	5
S. risoria P-//-	6	6	8	6	8	7
F_1 li/ri	6	6	8	8	8	7
C. livia	7	7	8	8	10	7
Z. macroura	5	6	8	8	8	8
F_1 mac/ri	6	7		8	8	5
jungle fowl	5	6	6	5	6	7
chicken	5	7	7	5	6	7
r.n. pheasant						
turkey	6	7	8	6	6	6
guinea fowl	5		6			
mallard	5	6	7	6	5	6
F_1 M/M	6	7	6	7	6	7
muscovy	0,5	7	0,7	7	10	8
human O	5	5	0	5	6	5
human A_3			2			
human A	5	5	2	4	7	5
human B	5	6	0,4	5	7	7
human AB						
hog	7	7	3	5	8	6
cow	3	4	0	0	4	4
sheep	3	6	0	7	6	6
w. t. deer	4	7			6	
horse	4	7	8	8	7	8
dog	6	7	8	5	6	8
cat	6	7	8	6	7	9
rabbit	7	8	7	6	7	7
rat	7	5	7	6	8	5
mouse	5	7	7	6	6	6
hamster	7			7	6	
guinea pig	5	4	7	5	8	5
Peromyscus	8	6		7	5	

Titer decode:	1	2	3	4	5	6	7	8	9	10
	0	4	16	64	256	1024	4096	16,384	65,536	262,144

Titers of phytohemagglutinins with red cells of various species

Chemical Specificity →	D-Man	a-D-GalNAc	a-D-GalNAc	D-GalNAc	I a-L-Fuc II D-GlcNAc	D-GlcNAc	β-D-Gal	
	Pisum sativum Alaska Pea	Dolichos biflorus	Phaseolus limensis (lunatus) Lima* bean	Glycine soja Soybean** Hawkeye	Ulex europaeus Gorse	Triticum vulgare aestivum Wheat	Arachis hypogaea Peanut	Chamaecyparis lawsoniana var. pendula Lawson's cypress
S. chinensis	2	0	0	5	0	4	1	2
F_1 ch/ri	2	0	0	5	0	4	2	2
F_1 ch/se	4	0	0	4	0	4	1	2
S. senegalensis	2	0	0	4	0	3	1	2
S. bitorquata		0	0	3	0	4	1	2
F_1 bit./ri		0	0	4	0	4	2	2
F_1 cap/se	4	0	0	6	0	4	1	2
F_1 semit/ri	4	0	0	6	0	4	0	2
S. humilis	0	0	0	5	0	4	1	2
F_1 hu/ri	0	0	0	6	0	4	0,4	2
S. risoria P+	0	0	0	7	0	4	7	2
S. risoria P-//+	0	0	0	7	0	2	0,1,2,3,5	1
S. risoria P-//-	0	0	0	5	0	3	4	2
F_1 li/ri	0	0	0,2,3,4	7	0	4	0	2
C. livia	0	0	0,3,4,5	0,4	0	4	0	2
Z. macroura	5	0	0	0,5	0	4	1	2
F_1 mac/ri	3	0	0	5		2	0	
jungle fowl		0	0	0	0	1	2	0
chicken	0	0	0	0	0	2	0,3	0
r.n. pheasant								
turkey	6	0	0,3	1	0,2		0	0
guinea fowl	0		0		0		6	
mallard	4	0	0,2	0	0	2	0	2
F_1 M/M	0	0	3		0	2	0	0
muscovy	0	0	4	0	0	4	0,3	2
human 0	4	0	0	0	3	1	0	0
human A_3					3			
human A	3	4	5	0,2	3	1	0	0
human B	3	0	0,2	0	3	1	0	0
human AB			4				0	
hog	4	1,2,4	0	0,3	0	2	4	1
cow	0	0	0	1	0	0	0	0
sheep	3	0	0	1		1	0	0
horse	5	1	0	0,3	0	4	0,2	0
dog	5	1	0	4	0	1,5	0	0
cat	5	2	0	0,3	0,2	3	4	1
rabbit	5	0	0	7	0	2	0,5	0
rat	7	0		0	0	1	6	0
mouse	5	1	0,1,2,3	1	0	1	0,2	0
hamster	5		4		0	2		
guinea pig	5	0		3		1		0
Peromyscus	7		0	3		1		

* marked strain differences
** prozone