COLORIMETRIC ESTIMATION OF IRON IN PHARMACEUTICAL PREPARATIONS.*

BY JOSEPH L. MAYER.

The National Formulary, in addition to giving a formula for beef, iron and wine, solution of iron peptonate, solution iron albuminate, etc., has a note appended to the process stating the approximate quantity of iron contained in the finished product. In view of the fact that the National Formulary is a legal standard, it is necessary to analyze this class of preparations to ascertain whether they are of the proper strength, and as there is no method of assay official, I have for a considerable time employed the following colorimetric method with excellent results:

Ten Cc. beef, iron and wine are diluted with distilled water to 500 Cc.; 5 Cc. of this solution are evaporated and ignited in a platinum dish, 5 Cc. HCl (1–1) added, the material boiled an instant, poured into a 100 Cc. Nessler tube, water added q. s. 100 Cc., 3 drops of $KMnO_4$ solution (5–1000) added to oxidize the iron, and after a few minutes 10 Cc. of KSCN solution (20–1000) added, the color produced being immediately compared with the iron standards.

The iron standards are made up according to the method of D. D. Jackson, by mixing definite quantities of two solutions, one containing potassium platinic chloride and the other cobaltous chloride (Tech. Quar., vol. xiii, No. 4, Dec., 1900, p. 320). Mr. Jackson suggested these for the analysis of water, for which purpose I have employed them for a number of years. The first edition of the "Standard Methods for the Examination of Water and Sewage" of the American Public Health Association contained them, but for some reason, unknown to me, the present second edition of that work has omitted the method. The standards are prepared so that when 100 Cc. of water are taken for analysis, the reading on the tubes indicates at once parts per million (mg. per L.). To determine the accuracy of the method, the following experiments were conducted, the sample employed being beef, iron and wine, the results recorded being the mean of several analyses, all of which yielded extremely close checks:

(*A*) Ten Cc. beef, iron and wine were diluted to 500 Cc., and 5 Cc. of this dilution were evaporated, ignited and treated as above in the colorimetric method. The material matched standard tube 1.75; then since 5 Cc. = tube 1.75 × 100 = the entire 500 Cc. dilution = 175. As the 500 Cc. contained 10 Cc. beef, iron and wine, this, multiplied by 10, equals 1750 for 100 Cc. beef, iron and wine. As the standards are so constructed that the reading gives immediately parts per million when 100 Cc. water is taken for analysis, then 100 Cc. beef, iron and wine would equal 1750 parts per million, or 1750 mg. per 1000 Cc. beef, iron and wine, or 175.0 mg. per 100 Cc. beef, iron and wine. Or, what is simpler, multiply the reading on the standard tube by 100, and when the above quantities of sample are employed, the result will be milligrammes of iron per 100 Cc. of sample. The sample indicated the presence of 0.175 Gm. iron per 100 Cc.

(*B*) Ten Cc. beef, iron and wine were taken, evaporated in a platinum dish on a water-bath, ignited by placing one Bunsen burner under the dish and playing another Bunsen flame, held in the hand, on top of the residue, thus easily ashing the material without any loss through foaming, etc. The dish containing the ash was then placed on the water-bath, 10 Cc. strong hydrochloric acid and 15 Cc. water added, and heated until completely dissolved. This was then filtered through a 9 cm., ashless filter paper into a 400 Cc. nonsol beaker, and the filter washed

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until free from iron, the solution in the beaker then oxidized by boiling with HNO_3, precipitated with filtered NH_4OH, filtered through a Gooch crucible, washed, dried, ignited and weighed as Fe_2O_3. The weight of $Fe_2O_3 \times .70 \times 10 =$ weight of iron as metallic iron per 100 Cc. The analysis indicated the presence of 0.2765 Gm. iron per 100 Cc. The difference between these figures and those obtained by the colorimetric method being so great, another gravimetric determination was made as follows:

(*C*) Ten Cc. beef, iron and wine were treated as under (*B*), the thoroughly washed precipitate of $Fe_2(OH)_6$ dissolved in hot HCl, the paper thoroughly washed, and the iron again precipitated from the solution, and the analysis completed as under (*B*).

The analysis indicated the presence of 0.2743 Gm. of iron per 100 Cc.

Another determination was made as follows:

(*D*) Ten Cc. beef, iron and wine were diluted with about 100 Cc. distilled water, ammonium chloride, and an excess of NH_4OH added and H_2S passed to saturation. About 10 Cc. ether were added, the material thoroughly stirred while heating on a water-bath, and filtered through a 9 cm. filter (the addition of ether and thorough stirring make the precipitate settle quickly and cause a very rapid filtration), washed thoroughly. The precipitate was then dissolved in HCl, catching the solution in a 400 Cc. nonsol beaker, the paper washed thoroughly and the solution boiled to get rid of H_2S, after which it was oxidized with HNO_3, the iron precipitated and the analysis conducted as under (*B*). The analysis indicated the presence of 0.175 Gm. iron per 100 Cc. of solution.

Another analysis was then made as follows:

(*E*) Ten Cc. beef, iron and wine were ignited and dissolved as under (*B*). This solution was then poured into a porcelain evaporating dish, HNO_3 added to oxidize, boiled and evaporated to dryness on a water-bath. Water was added and the material was again evaporated to dryness. This treatment was repeated until all HNO_3 was expelled, after which the residue was dissolved in HCl, transferred to a 100 Cc. glass-stoppered flask and the assay completed by the U.S.P. Iodometric Method. The analysis indicated the presence of 0.1787 Gm. iron per 100 Cc.

Another analysis was made as follows:

(*F*) Ten Cc. beef, iron and wine were ignited as under (*B*), and the ash carefully moistened with a few drops of HNO_3, evaporated, ignited, and the material dissolved by heating with diluted HCl (10–15), and the determination finished by the U.S.P. Iodometric Method. The analysis indicated the presence of 0.1789 Gm. iron per 100 Cc.

Another determination was made as follows:

(*G*) Ten Cc. beef, iron and wine were ignited and dissolved in HCl as under (*B*). This solution transferred to a 250 Cc. Erlenmeyer flask almost filled with distilled water, heated to almost boiling, H_2S gas passed to saturation, boiled on a gauze (gently at first to avoid loss) until the solution was reduced to about one-half its volume, cooled and titrated with N/10 $KMnO_4$ V.S. until the appearance of a permanent pink tint (Conn. Agr. Exp. Sta., 1907–08, page 685). The analysis indicated the presence of 0.1839 Gm. of iron per 100 Cc.

Another determination was made as follows:

(*H*) Ten Cc. of beef, iron and wine were ignited and dissolved in HCl as under (*B*), the solution reduced with stannous chloride and titrated with N/10 $K_2Cr_2O_7$ as directed in the methods of the U. S. Steel Corporation for the analysis of iron ores (*Journ. Ind. Eng. Chem.*, Feb., 1909, page 107). The analysis indicated the presence of 0.1831 Gm. of iron per 100 Cc. Another determination was made as follows:

(*I*) Ten Cc. beef, iron and wine were ignited and dissolved as under (*B*),

the solution reduced with stannous chloride and titrated with N/10 $KMnO_4$, as directed in the methods of the U. S. Steel Corporation for the analysis of iron ores (Journ. Ind. Eng. Chem., Feb., 1909, page 107). The analysis indicated the presence of 0.1776 Gm. iron per 100 Cc.

Another determination was made as follows:

(*J*) Ten Cc. beef, iron and wine were ignited and dissolved as under (*B*), the solution transferred to a 250 Cc. Erlenmeyer flask fitted with a rubber stopper and Bunsen valve, a few crystals of $KClO_3$ added, placed on the hot plate, boiled gently a few minutes, about 2 Gm. of iron-free zinc added (.002 percent Fe), a little sodium carbonate added to expel the air, heated nearly to boiling until the color of the solution was green and entirely free from the slightest tint of yellow. The stopper was then removed and a mixture of 10 Cc. H_2SO_4 and 20 Cc. H_2O added, and, after adding a small amount of sodium carbonate to expel the air, the stopper was replaced and the solution again heated until no undissolved particles of zinc remained. After allowing the solution to cool, it was diluted with cold, recently-boiled, distilled water and titrated with N/10 $KMnO_4$ until the appearance of a pink tint. The analysis indicated the presence of 0.1776 Gm. iron per 100 Cc.

The results by all methods were as follows:

A. 0.175 Gm. iron per 100 Cc. beef, iron and wine.
B. 0.2765 Gm. iron per 100 Cc. beef, iron and wine.
C. 0.2743 Gm. iron per 100 Cc. beef, iron and wine.
D. 0.1750 Gm. iron per 100 Cc. beef, iron and wine.
E. 0.1787 Gm. iron per 100 Cc. beef, iron and wine.
F. 0.1789 Gm. iron per 100 Cc. beef, iron and wine.
G. 0.1839 Gm. iron per 100 Cc. beef, iron and wine.
H. 0.1831 Gm. iron per 100 Cc. beef, iron and wine.
I. 0.1776 Gm. iron per 100 Cc. beef, iron and wine.
J. 0.1776 Gm. iron per 100 Cc. beef, iron and wine.

A glance at the above table will show that all methods excepting (*B*) and (*C*)—both practically identical—yielded the same results, the mean (excluding (*B*) and (*C*)) being 0.1787.

I am at a loss to account for the high results under (*B*) and (*C*), for, if it is assumed that the wine employed in making the beef, iron and wine contained aluminum, or that the precipitate was contaminated with silica dissolved by the alkali from the glass, this same condition should hold for (*D*), where the iron was precipitated with NH_4OH and H_2S, dissolved and reprecipitated with NH_4OH, which, of course, would precipitate aluminum and silica. The precipitations were made in nonsol beakers, the solutions being filtered very rapidly to avoid contamination with the silica of the glass.

The fact that the results by method (*D*) closely check the colorimetric and volumetric methods makes it difficult to explain these high results.

It is clearly proven by these results that the determination of iron in this class of preparations by precipitation, as hydroxide, ignition and weighing, as oxide, is apt to lead to high results and is therefore not a suitable method.

In laboratories equipped with the iron standards, the colorimetric method for the quantitative estimation of iron is extremely accurate, easy to apply and rapid. Should, however, another method be desired, any of the volumetric methods embodied in this paper will give accurate results.

RESEARCH AND ANALYTICAL DEPARTMENT,
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PHARMACOPŒIAL BOTANIC DRUGS OF THE TWENTIETH CENTURY.*

By E. N. Gathercoal.

Latin plant names	English names	Austrian	Belgian	British	Croatian	Danish	French	German	Hungarian	Italian	Japanese	Mexican	Netherlands	Norwegian	Russian	Servian	Spanish	Swedish	Swiss	U. S. P. VIII	U. S. P. IX
(9) Pinus montana																					
(10) Pinus Australis																					
(11) Pinus maritima																					
(12) Abies Sibirica																					
389. Piper angustifolium, lv	Matico											X								X	
390. Piper Betle, lv	Betel			X																	
391. Piper Cubeba, unr. ft	Cubeb	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
392. Piper Cubeba, v. o	Oil of Cubeb			X																X	X
393. Piper officinarum, ft	Long Pepper						X														
394. Piper methysticum, rh	Kava-Kava			X																	
395. Piper nigrum	Black Pepper	X	X								X	X								X	X
396. Pistacia Lentiscus, res	Mastic	X	X		X							X		X		X	X	X		X	
397. Pistacia terebinthus, balsamic, res	Chios Turpentine																				
398. Plantago major, lv	Plantain											X					X				
399. Plantago ovata, s				X																	
400. Plantago psyllium, s	Fleaseed											X					X				
401. Podophyllum Emodi, rh. & rt	Indian Podophyllum			X																	
402. Podophyllum peltatum, rh. & rt	Mandrake		X	X			X			X		X	X				X			X	X
403. Polygala amara, plant	Bitter Polygala					X															
404. Polygala Senega, root	Senega	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
405. Polygonum aviculare, fl. herb	Knotgrass	X																			
406. Polygonum Bistorta, rh	Bistort		X				X														
407. Polyporpus fomentarius, fungus	Surgeon's Agaric	X					X					X									
408. Polyporpus officinalis, fungus	White Agaric	X					X			X		X					X		X		
409. Populus nigra, buds	Black Poplar						X										X				
410. Potentilla Tormentilla, rh	Tormentilla						X												X		
411. Prunus Amygdalus, var. amara, s	Bitter Almond	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	
412. Prunus Amygdalus, v. o	Oil of Bit. Almond						X					X	X				X			X	X
413. Prunus Amygdalus, var. dulcis, s	Sweet Almond	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
414. Prunus Amygdalus, both varieties, fo	Sweet Almond Oil		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
415. Prunus armeniaca, s	Apricot Seed										X										
416. Prunus domestica, ft	Prunes												X							X	
417. Prunus Laurocerasus, lv	Cherry Laurel		X	X			X			X			X				X				
418. Prunus Laurocerasus, v. o	Oil of Cherry Laurel												X								
419. Prunus macrophylla, lv											X										
420. Prunus serotina, bk	Wild Cherry Bark			X								X								X	X
421. Psidium Guaiava, lv													X								
422. Pterocarpus Morsupium, ext. wd	Kino			X							X								X	X	X
423. Pterocarpus santalinus, ht.wd	Red Saunders	X		X							X		X				X	X		X	X
424. Pueraria Thunbergiana, rt. stch	Kuzu Starch										X										

*Continued from p. 421, April issue.

425. Punica Granatum, rt. & st. bk	Pomegranate Bark	×	×		×	×	×	×	×	×	×	×	×		×	×	×		×	×	×			
426. Punica Granatum, ft. j	Pomegranate Juice										×					×								
427. Punica Granatum, ft. rd	Pomegranate Rind										×	×												
428. Quassia amara, ht.wd	Surinam Quassia	×	×				×		×	×	×	×	×	×	×		×	×	×	×	×	×	×	×
428a. Quercus infectoria, galls	Galls	×	×	×	×	×	×	×			×	×		×	×	×		×	×	×				
429. Quercus species, in. bk	Oak Bark	×			×		×	×	×			×		×	×				×	×				
Q. alba	White Oak																			×				
Q. pedunculata	Summer Oak	×						×							×	×								
Q. Robur	English Oak						×	×				×				×				×				
Q. sessiflora	Winter Oak	×			×			×							×	×								
430. Quercus pedunculata, s	Acorns, Acorn Coffee	×													×									
431. Quillaja Saponaria, in. bk	Soap Bark	×		×		×		×	×			×	×							×	×			
432. Quillaja Smegmadermis, bk							×																	
433. Rhamnus cathartica, fr. ft	Buckthorn Berries		×				×																	
434. Rhamnus frangula, bk	Buckthorn Bark	×	×			×	×	×			×		×	×	×				×	×	×	×		
435. Rhamnus Purshiana, bk	Cascara Bark	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×		
436. Rheum species, rh. & rt	Rhubarb, Chinese	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×		
R. palmatum		×			×		×	×					×					×	×	×	×	×		
R. officinale		×	×	×		×	×	×	×	×		×	×		×					×	×	×		
R. officinale, var tanguiticum												×						×			×	×		
R. tanguiticum																×								
437. Rheum Rhaponticum, rh. & rt	Rhubarb, Eu						×					×												
438. Rhus glabra, ft	Sumach Berries																				×			
439. Rhus semialata, galls	Chinese Galls										×													
440. Ribes rubrum, fr. ft	Red Currants						×												×					
441. Ricinus communis, s	Castor Bean						×		×			×							×					
442. Ricinus communis, f. o	Castor Oil	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×		
443. Rinacanthus communis, rt													×											
444. Rosa centifolia, petals	Pale Rose Petals						×	×				×							×		×			
445. Rosa gallica, petals	Red Rose Petals	×	×	×			×		×				×		×		×		×		×	×	×	
446. Rosa rugosa, petals											×													
447. Rosa species, v. o. fm. fl	Oil of Rose	×	×	×		×	×	×	×		×		×	×							×	×		
R. damascena				×		×	×							×							×	×		
R. gallica																					×			
448. Rosmarinus officinalis, lv	Rosemary	×	×		×		×		×	×		×			×	×	×		×					
449. Rosmarinus officinalis, v. o. fl. tp	Oil of Rosemary	×	×	×	×	×	×	×		×	×		×	×	×	×	×	×	×	×	×	×	×	×
450. Rubus fruticosus, ft	Eu. Blackberry									×		×												
451. Rubus Idæus, ft	Red Raspberry						×						×						×					
452. Rubus villosus, rt. bk	Blackberry Bark																					×		
453. Ruscus aculeatus, rh							×												×					

393. French—Chavica officinarum.
410. Swiss—Potentilla silvestris.
411. Belgian, Danish, French, Italian, Russian and Spanish—Amygdalus communis, var. amara.
413. Belgian, Danish, French, Italian, Netherlands, Russian and Spanish—Amygdalus communis, var. dulcis.
428a. Mexican, Russian and Spanish—Q. lusitanica, var. infectoria.
430. Also from Quercus sessiflora.
452. U. S. P. VIII—also from R. cuneifolius and R. nigrobaccus.

Latin plant names	English names	Austrian	Belgian	British	Croatian	Danish	French	German	Hungarian	Italian	Japanese	Mexican	Netherlands	Norwegian	Russian	Servian	Spanish	Swedish	Swiss	U.S.P. VIII	U.S.P. IX
454. Ruta graveolens, lv. or hb	Rue						X					X					X		X		
455. Ruta graveolens, v. o. hb	Oil of Rue		X																		
456. Saccharomyces Kefir, fungus	Kefir														X						
457. Salvia officinalis, lv	Sage	X			X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	
458. Sambucus nigra, fl	Elder Flowers	X	X		X	X	X	X	X	X	X		X	X	X	X	X	X	X		
459. Sambucus nigra, ft	Elder Berries									X			X								
460. Sambucus nigra, ft. j	Elder Berry Juice	X			X				X				X				X		X		
461. Sanguinaria Canadensis, rh	Bloodroot																			X	X
462. Santalum album, ht. wd	Sandalwood						X										X				
463. Santalum album, v. o	Sandalwood Oil	X	X	X	X	X	X	X		X	X		X	X	X	X	X	X	X	X	X
464. Saponaria officinalis, rt	Soapwort						X					X									
465. Sassafras officinale, pith	Sassafras Pith																			X	
466. Sassafras officinale, rt	Sassafras Root										X										
467. Sassafras officinale, rt. bk	Sassafras Bark											X							X	X	X
468. Sassafras officinale, rt. wd	Sassafras Wood	X						X					X				X				
469. Sassafras officinale, v. o	Oil of Sassafras											X					X			X	X
470. Satureja hortensis, hb							X														
471. Schleichera trijuga, f. o. s	Koesambi Oil												X								
472. Scolopendrium officinale, hb													X								
473. Scopola Carniolica, rh	Scopola										X									X	
474. Scorozonera Hispanica, rt																	X				
475. Scutellaria lateriflora, fl. hb	Scullcap																			X	
476. Serenoa serrulata, ft	Sabal																			X	X
477. Sesamum Indicum, f. o. s	Sesame Oil	X		X	X			X	X		X	X	X		X	X			X		X
478. Simaruba amara, rt. bk	Simaruba Bark							X				X	X						X		
479. Sempervivum tectorum, lv																	X				
480. Shorea Stenoptera, f. o. s	Shorea Oil												X								
481. Sinapis alba, s	White Mustard		X				X					X							X	X	X
482. Sinapis cernua, s	Jap. Mustard										X										
483. Smilax species, rt	Sarsaparilla	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
S. medica	Mexican S				X		X			X		X			X		X			X	X
S. officinalis	Honduras S									X					X		X			X	X
S. ornata	Jamaica S																			X	X
S. papyracea	Para S																			X	X
S. syphilitica										X							X				
484. Smilax China, rh																	X				
485. Solanum Dulcamara, st	Bittersweet	X					X					X					X				
486. Solanum nigrum, lv							X					X					X				
487. Solanum tuberosum, stch. of tu	Potato Starch		X				X				X		X								
488. Spergularia rubra, hb																	X				

489. Spigelia Marilandica, rh. & rt.	Pinkroot																			X	X
490. Spirea ulmaria, fl.			X																X		
491. Stillingia sylvatica, rt.	Queen's Root																			X	X
492. Strophanthus species, s.	Strophanthus	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
S. hispidus			X		X		X			X		X					X				X
S. Kombe				X		X		X	X				X	X	X	X	X		X	X	X
493. Strychnos Ignatia, s.	Ignatia Beans						X					X					X				
494. Strychnos Nuc Vomica, s.	Nux-Vomica	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
495. Styrax species, bals. res.	Benzoin	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
S. Benzoinum	Sumatra Benzoin		X	X	X		X			X		X	X		X	X	X			X	X
S. species of Siam	Siam Benzoin	X				X		X	X	X	X	X		X			X	X	X	X	X
496. Swertia Chirata, pl.	Chiretta			X																X	
497. Symplocos odoratissima, lv.													X								
498. Tamarindus Indica, ft. pp.	Tamarinds	X	X	X	X		X	X	X	X	X	X	X	X	X		X		X	X	
499. Tanacetum Balsamita, lv.	Costmary																X				
500. Tanacetum vulgare, fl. tp.	Tansy		X																		
501. Taraktogenos Kurzii, f. o.				X																	
502. Taraxacum officinale, pl.	Dandelion							X			X		X		X						
503. Taraxacum officinale, rt.	Dandelion Root	X		X	X				X	X		X			X			X	X	X	X
504. Taraxacum officinale, lv.	Dandelion Leaves	X			X		X					X					X				
505. Terminalia Chebula, immat. ft.	Chebulic Myrobalans			X																	
506. Teucrium Chamædrys, fl. hb.							X														
507. Teucrium Scordium, fl. hb.	Water Germander						X					X					X				
508. Thapsia garganica, rt.	Thapsia											X					X				
509. Thapsia garganica, res. rt.	Thapsia Resin						X					X					X				
510. Thea sinensis, lv.	Tea	X			X		X					X				X	X				
511. Theobroma Cacao, s.	Cacao Beans											X					X				
512. Theobroma Cacao, s. paste	Bitter Chocolate					X							X						X		
513. Theobroma Cacao, f. o.	Cacao Butter	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X
514. Thymus Serpyllum, fl. hb.	Wild Thyme	X					X	X							X				X		
515. Thymus Serpyllum, v. o.	Oil of Thyme		X																		
516. Thymus vulgaris, fl. hb.	Garden Thyme		X				X	X		X				X	X		X		X		
517. Thymus vulgaris, v. o.	Oil of Thyme					X	X	X			X			X	X	X	X		X	X	X
518. Tilia species, fl. & bracts	Linden Flowers	X	X		X		X	X	X	X	X		X			X	X		X		
T. cordata								X					X								
T. platyphylla		X	X		X		X	X	X	X	X		X			X	X		X		
T. ulmifolia					X				X	X	X										
519. Toluifera Pereiræ, bals.	Peru Balsam	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
520. Toluifera Balsamum, bals.	Tolu Balsam	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X
521. Trigonella fœnum-græcum, s.	Fenugreek	X	X					X				X							X		

457. Spanish—also from S. lavendulæfolia.
462. Spanish—also from S. Preycinetianum.
465. Austrian, Mexican and Swiss—S. officinalis; U. S. P. VIII and IX—S. variifolium.
473. Japanese—from S. Japonica.
477. Austrian and Russian—S. orientalis.
478. Swiss—S. officinalis.

510. French and Spanish—T. Chinensis.
518. Russian—T. parviflora (ulmifolia) and T. grandiflora (platyphylla).
519. Belgian, British, German, Japanese, Mexican, Netherlands, Norwegian, Servian, Spanish and Swedish—Myroxylon Pereiræ.
520. British, Japanese, Mexican, Netherlands, Norwegian, Spanish and Swedish—Myroxylon toluiferum; German—Myroxylon balsamum.

Latin plant names	English names	Austrian	Belgian	British	Croatian	Danish	French	German	Hungarian	Italian	Japanese	Mexican	Netherlands	Norwegian	Russian	Servian	Spanish	Swedish	Swiss	U.S.P.VIII	U.S.P.IX
522. Triticum vulgare, flour fm. s	Wheat Flour						X														
523. Triticum vulgare, stch. fm. s	Wheat Starch	X	X	X		X	X			X		X	X	X	X	X	X	X			
524. Tussilago Farfara, fl	Coltsfoot Flowers						X														
525. Tussilago Farfara, lv	Coltsfoot Leaves	X				X		X			X			X	X		X				
526. Ulmus fulva, in. bk	Slippery Elm Bark																			X	X
527. Umbilicus pendulinus, lv																	X				
528. Uragoga Ipecacuanha, rt	Ipecac, Rio	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
529. Urginea maritima, bulb scales	Squill	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
530. Urginea Indica, bulb scales	Indian Squill			X																	
531. Vaccinium myrtillus, ft	Blueberries	X											X	X				X	X		
532. Valeriana officinalis, rh. & rt	Valerian	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
533. Valeriana officinalis, v. o	Oil of Valerian	X																			
534. Valeriana Wallichii, rh. & rt	Indian Valerian			X																	
535. Vanilla planifolia, ft	Vanilla	X	X				X				X	X							X	X	
536. Veratrum album, rh. &. rt	White Hellebore		X					X	X			X						X	X	X	
537. Verbascum species, fl., without calyx	Mullein Flowers	X	X		X	X	X	X			X				X				X		
V. phlomoides		X			X	X		X			X				X				X		
V. thapsiforme					X	X	X	X			X				X				X		
V. Thapsus			X			X															
538. Veronica officinalis, hb	Speedwell					X	X														
539. Veronica Virginica, rh. & rt	Leptandra																			X	
540. Viburnum prunifolium, rt. bk	Black Haw Bark	X		X			X					X	X			X	X			X	X
541. Viburnum Opulus, bk	Cramp Bark																			X	
542. Vinca minor, lv	Periwinkle						X														
543. Viola odorata, fl	Violet Flowers						X			X		X					X				
544. Viola tricolor, fl. hb	Pansy	X						X											X		
545. Xanthoxylon Americanum, bk	N. Prickly Ash																			X	X
546. Xanthoxylon Clava-Herculis, bk	S. Prickly Ash																			X	X
547. Zea mays, styles & stigmas	Corn Silk						X					X					X			X	
548. Zea mays, stch. of s	Corn Starch		X	X																X	X
549. Zingiber officinale, rh	Ginger	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X
550. Zizyphus vulgaris, ft	Jujube Berries																X				

523. French and German—T. sativum.
528. Italian and U.S.P. VIII and IX—Cephælis Ipecacuanha; U. S. P. VIII and IX—also from Cephælis acuminata (Carthagena Ipecac); British—Psychotria Ipecacuanha.
529. Belgian, French, Mexican, Netherlands, Russian and Spanish—Urginea Scilla.
536. U. S. P. VIII—also from V. viride (Am. Hellebore) and U. S. P. IX from V. viride only.
540. U. S. P. VIII and IX—also from V. Lentago.
546. U. S. P. VIII—Pagara Clava—Herculis.
549. Belgian—Amomum Zingiberis.

ABBREVIATIONS.

olr., oleoresin.
pfd., purified.
p., pure.
v.o., volatile oil.
s., seed.
lv., leaves.
bk., bark.
ext., extract.
exud., exudation.
g., gum, gummy.
fl., flower, flowering, florets.
rt., root.
rh., rhizome.
hb., herb.
ft., fruit.
res., resin.
fr., fresh.
wd., wood.
i.j., inspissated juice.
th., thallus.
tp., tops.
hd., head.
f.o., fixed oil.
st., stem.
fm., from.
emp., empyreumatic.
ht., heart.
lig., ligulate.
lf., leaflets.
in., inner.
pd., peeled.
ri., rind.
unr., unripe.
j., juice.
sc., sclerotium.
k., kernel.
co., corm.
sg., stigma.
pl., plant.
ster., sterile.
stch., starch.
bd., buds.
i.m.j., inspissated milky juice.
tu., tuber.
mu., mucilage.
h., hairs.
cl., cleansed.
bals., balsam.
spo., spores.

INDEX OF BOTANICAL NAMES NOT IN THE ALPHABETICAL LIST.

INDEX OF ENGLISH NAMES.

CORRECTIONS.

The following items should be deleted from the U.S.P. IX column:

41. Apocynum Cannabium, Canadian Hemp
130. Citrus Limonum, Lemon Juice
209. Euonymus Atropurpureus, Wahoo
241. Gossypium Herbaceum, Cotton Root Bark

In the list of pharmacopœias, the following items should be corrected as follows:

Farmacopea ufficiale del Regno d'Italia, 3d ed., 1909
Russian Pharmacopœia, 6th ed., 1910
Farmacopea Argentina, 1898
Farmacopea Venezolana, 1898