**Table 1** The extraction, purification, and structural characterization of polysaccharides from the longan fruit pulp.

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| No. | Componentname | Extraction method | Purification method | Monosaccharide composition | Mw (Da) | Structures features | Structure-activity relationship | Ref. |
| 1 | LPS1 | Hot water | Gel filtration and anion-exchange chromatography | Glc (Consists of 661 glucose residues) | 1.08×105 | (1→6)-*α-D*-glucan | Immunomodulatory and anti-cancer | (Zhu et al., 2013) |
| 2 | LP-H | Hot water | Sevage | Rha:Ara:Man:Glc:Gal = 1.2:4.6:1:3:2.2 | 2.38×105 | Mainly consisted of →3)-*α-L*-Ara*f*-(1→, →3,6)-*β-D*-Gal*p*-(1→, *α-L*-Rha*p*-(1→, →4)-*β-D*-Glc*p*-(1→ | Prebiotic | (Huang et al., 2019c) |
| 3 | LP-S | SuperfineGrinding | Rha:Ara:Man:Glc:Gal = 1.2:4.9:1:2.1:4 | 2.28×105 | Mainly consisted of →3)-*α-L*-Ara*f*-(1→, →3,6)*-β-D*-Gal*p*-(1→, *α-L*-Rha*p*-(1→, →4)-*β-D*-Gal*p*-(1→ | Prebiotic |
| 4 | LP-SE | Superfine grinding-assisted enzymatic | Rha:Ara:Man:Glc:Gal = 1.1:4.3:1:1.5:2.8 | 1.90×105 | Mainly consisted of →3)-*α-L*-Ara*f*-(1→, →3,6)-*β-D*-Gal*p*-(1→, *α-L*-Rha*p*-(1→, →5)-*α-L*-Ara*f*-(1→ | With better prebiotic |
| 5 | LP-UE | Ultra-high pressure-assisted enzyme | Sevage | Rha:Ara:Xyl:Man:Glc:Gal = 5.8:40.8:1:2.3:32.5:26.7 | 2.91×105 | *β*-type glycosidic bond | Moderate acetylcholinesterase inhibitory | (Bai et al., 2017) |
| 6 | LP-H | Hot water | Rha:Ara:Xyl:Man:Glc:Gal = 1.1:11.9:1:1.6:12.2:11.1 | 1.19×105 | Slight acetylcholinesterase inhibitory |
| 7 | LP-U | Ultra-high pressure | Rha:Ara:Xyl:Man:Glc:Gal = 1.2:11.7:1.2:1:10:12.4 | 1.32×105 |
| 8 | LP-E | Enzymatic method | Rha:Ara:Xyl:Man:Glc:Gal = 5.9:46.2:1:6:22.2:33.7 | 3.18×105 |
| 9 | LP | Unfermented, hot water | Sevage | Rha:Ara:Xyl:Man:Glc:Gal = 5.7:28.5:1:1.5:15.3:13.3 | 2.22×105 | Mainly consisted of *α*-type and *β*-type glycosidic bond | Immunomodulatory and prebiotic | (Huang et al., 2019b) |
| 10 | LP-F | After fermentation, hot water | Sevage | Rha:Ara:Xyl:Man:Glc:Gal = 5.1:26.5:1:1.8:7.8:12.4 | 1.11×105 | Stronger immunomodulatory and prebiotic |
| 11 | LPs | Water extraction, alcohol precipitation | Gel filtrationchromatography | Man:Rib:Rha:GlcA:GalA:Glu:Gal = 4:1.25:3.75:3:1:25:5.25 | （2.13–7.07）×103 | N/A | Immunostimulatory and free radical scavenging | (Yi et al., 2019) |
| 12 | MLPs | Water extraction, alcohol precipitation | Gel filtrationchromatography | Man:Rib:Rha:GlcA:GalA:Glu:Gal = 19:1:17:13:3:100:24 | 2.78 × 104–1.00 × 106 | Possess more branched structures | Stronger free radical scavenging abilities and immune-stimulating effects, but weaker growth-inhibitory activitiesagainst cancer cells |
| 13 | LP1 | Hot water | Sevage, chromatography ofDEAE-celluloseand Sephadex G-100 | N/A | 1.23×103 | N/A | Immunomodulatory and anti-tumor | (Jiang et al., 2014) |
| 14 | LP1-S | Hot water | Sevage, chromatography ofDEAE-celluloseand Sephadex G-100 | N/A | 1.05×105 | N/A | Immunomodulatory and stronger anti-tumor |
| 15 | LPIIa | Ultrahigh pressure-assisted enzymatic | HiPrep 26/60 Sephacryl S-300 HR column | Rib:Ara:Xyl:Glc:Gal =1.05:1:22.88:1.01:2.59:34.58 | 1.59×105 | The backbone consisted of (1→3,4)-*α*-Rha*p*, (1→4)-*β*-Gal*p*, (1→6)-*β*-Gal*p*, (1→3,6)-*β*-Gal*p*, with branches at the O-4 of Rha and O-3 of Gal, consisting of side chains of *α*-Ara*f*, *β*-Gal*p*, and *α*-Glc*p* | Anti-inflammatory and protective intestinal barrier function | (Bai et al., 2020c) |
| 16 | LP3 | After extraction with distilled water, cellulase enzymolysis and ultrasonic cell disintegration were used. | Anion exchange resin D301-F | Rib:Rha:Ara:Xyl:Man:Glc:Gal = 4.85:1.06:14.55:1.00:28.36:70.89:8.58 | N/A | N/A | Strong immunoregulatory | (Yi et al., 2011b) |
| 17 | LPP | N/A | Sephadex G-100 gel column and gel filtration chromatogram | ­­­ N/A | 3.75×104 | N/A | The combination of FITC pre-labeling and HPSEC-FD makes the quantitative determination of LPPpossible in mouse plasma, spleen and lung samples | (Min et al., 2015) |
| 18 | LPPF | N/A | Sephadex G-100 gel column and gel filtration chromatography | N/A | 3.9×104 | N/A |
| 19 | LPⅠ | N/A | DEAE-celluloseanion-exchange chromatography | Rib:Rha:Ara:Xyl:Man:Glc:Gal = 0.57:0.01:1.00:0.20:9.64:21.84:0.73 | 1.459×104 | Mainly consisted of (1→6)-*α-D*-Glc*p*, (1→5)-*α-L*-Ara*f* and (1→4)-*β-D*-Man*p* | Except for LPI, the other three significantly stimulated lymphocyte proliferation in the dose range of 100–400 μg/mL and their stimulations on normal/LPS-induced proliferation and depressions on ConA-Induced proliferation could be ordered as LPIII > LPIV > LPII > LPI. All the fractions had the optimal dose of 100 μg/mL on enhancing macrophage phagocytosis. Among them, LPII had the considerable yield and activity for exploiting as a potential immunoadjuvant | (Yi et al., 2012a) |
| 20 | LPⅡ | Rib:Rha:Ara:Xyl:Man:Glc:Gal = 1.00:0.22:3.00:0.21:5.85:14.62:1.77 | 6.834×104 | Mainly consisted of (1→6)-*α-D*-Glc*p*, (1→5)-*α-D*-Ara*f* and *β-D*-Gal*p* |
| 21 | LPⅢ | Rib:Rha:Ara:Xyl:Man:Glc:Gal = 1.00:3.21:4.70:0.56:0.41:0.66:2.18 | 1.074×105 | Mainly consisted of (1→4)-*β-D*-Rha*p* and (1→5)-*α-L*-Dra*f* |
| 22 | LPⅣ | Rib:Rha:Ara:Xyl:Man:Glc:Gal = 7.52:7.58:7.69:7.82:9.59:9.70:9.91 | 5.282×106 | N/A |
| 23 | LPD2 | Hot water | Weak anion exchanger | Ara:Ma:Glc:Gal = 0.25:0.49:1:0.5 | 9.64×106 | The main linkages of the sugar residues were (1→4)-*β*-Glc and (1→6)-*β*-Man | Significantly enhanced the lymphocytes proliferation,phagocytosis and NO and IL-6 secretion by macrophage | (Rong et al., 2019) |
| 24 | LPIa | Hot water | Sevage, DEAE-Sepharose Fast Flow chromatography and HiPrep 26/60 Sephacryl S-300 HR chromatography | Rha:Rib:Fuc:Ara:Xyl:Man:Glc:Gal = 0.99:1.37:34.61:1.48:1.73:5.86:55.16 | 1.47×105 | Mainly consisted of →3)-*α*-Ara*f*-(1→, →3,6)-*β*-Gal*p*-(1→, *α*-Ara*f*-(1→ and →5)-*α*-Ara*f*-(1→ | Both LPIa and LPIIa have higher intestinal barrier protection and immunoregulatory activities than LPIIIa and LPIVa | (Bai et al., 2020a) |
| 25 | LPIIa | Rha:Rib:Ara:Xyl:Glc:Gal = 1.05:1.00:22.88:1.01:2.59:34.58 | 1.593×105 | Mainly consisted of →3)-*α*-Ara*f*-(1→, →3,6)-*β*-Gal*p*-(1→, *α*-Ara*f*-(1→ and →5)-*α*-Ara*f*-(1→ |
| 26 | LPIIIa | Rha:Rib:Fuc:Ara:Man:Glc:Gal = 14.46:1.85:2.31:46.17:1.00:1.97:20.99 | 1.94×104 | Mainly consisted of →3)-*α*-Ara*f*-(1→, →3,6)-*β*-Gal*p*-(1→, →3)-*β*-Gal*p*A-(1→ and *α*-Rha*p*-(1→ |
| 27 | LPIVa | Rha:Rib:Ara:Man:Glc:Gal = 4.71:0.38:25.03:1.00:2.53:15.50 | 4.4×104 | Mainly consisted of →3)-*α*-Ara*f*-(1→, →3,6)-*β*-Gal*p*-(1→, →3)-*β*-Gal*p*A-(1→ and *α*-Rha*p*-(1→ |
| 28 | LPPMs | Alkali-extraction and acid-precipitation | N/A | N/A | N/A | N/A | Anti-oxidation, anti-tumor and immune stimulation activity were enhanced | (Han et al., 2017) |
| 29 | LP1 | Ultrasound-assisted enzymatic method | Gel column chromatograms | Rib:Rha:Ara:Xyl:Man:Glc:Gal = 6.1:4.9:52.2:1:11.1:72.2:20.3 | >105 | N/A | The immunoregulatory activity was weaker than that of LP2 and LP3 | (Yi et al., 2011a) |
| 30 | LP2 | Rib:Rha:Ara:Xyl:Man:Glc:Gal = 2:1:16.7:23.7:57.2:114.3:2.2 | Mainly composed of glucosyl residues in the *α*-pyranose form | Immunoregulatory activity |
| 31 | LP3 | Rib:Rha:Ara:Xyl:Man:Glc:Gal = 11.7:1:33.3:4.7:213.3:472:13.3 | Immunoregulatory activity |
| 32 | LP1 | Hot water extraction and alcoholPrecipitation | DEAE-cellulose anion-exchange and Sephacryl S-300 HR gel chromatography | Glc:GalA:Ara:Gal = 5.39:1.04:0.74:0.21 | 1.16× 102 | Consisted of a backbone of→4)-*α-D*-Glc*p*-(1→4)-*α-D*-Gal*p*A-(1→4)-*α-D*-Glc*p*-(1→4)-*β-D*-Glc*p*-(1→ units with poly saccharide side chains composed of →2)-*β-D*-Fru*f*-(1→2)-*L*-sorbose-(1→ attached to the O-6 position of the *α-D*-Glc*p* residues | Natural anti-tumor agent with immunomodulatory activity | (Meng et al., 2014) |
| 33 | LPIIa | Hot water | Ion exchange chromatography, gel filtration chromatography | Glc:Ara:Man:Gal = 7.55:1.45:1.22:1.00 | 4.47×104 | Mainly composed of→6)-Glc-(1→, →5)-Ara-(1→, →4)-Man-(1→ and →6)-Gal-(1→ | Strong immunoregulatory | (Yi et al., 2015) |
| 34 | LPS-N | Hot water-assisted microwave pretreatment and ethanol precipitation method | DEAE- Cellulose anion exchange chromatography | Xyl:Glc = 1:1.9 | 1.38×104 | Belong to *β*-type heteropolysaccharide with pyran group | N/A | (Yang et al., 2008b) |
| 35 | LPS-A1 | Rha:Xyl:Ara:Gal = 1:1.64:4.33:2.28 | 1.382×103 |
| 36 | LPS-A2 | Only Rha | 5.71×105 |
| 37 | LWP | Longan juice ferments | Ultrafiltration | Glc:Man:Gal:Ara:GalA: GlcA = 167.72:3.38:3.13:3.46:2.33:1 | (1–3) ×104 | Mainly composed of *β*-type | Hypoglycemic activity and free radical scavenging | (Huang et al., 2019a) |
| 38 | LPsx | Hot water extraction and alcohol Precipitation | HPGPC system coupled with Ultrahydragel columns 500 and 250 gel columns at 60 °C | Glu:Ara:Gal:Man:Xyl = 95.9:2.1:1.0:0.6:0.4 | 4.102×103 | Mainly composed of (1→6)-*α-D*-Glu and (1→6)-*β-D*-Glu, branched with *α-D*-Glu-(1→ | The immunomodulatory activity study showed that LPsx significantly increased the phagocytosis of macrophages, and strongly promoted the production of NO, IL-1*β*, IL-6 and TNF-*α*. Moreover, LPsx could inhibit the inflammatory response induced by lipopolysaccharide. | (Lan et al., 2021a) |