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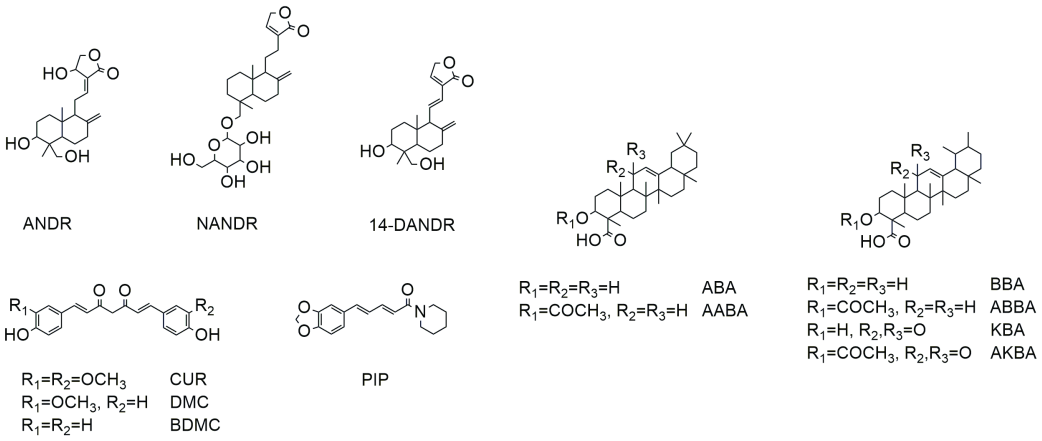


**Fig. S1.** Structures of selected analytes. ANDR=andrographolide, NANDR=neoandrographolide, 14-DANDR=14-deoxy-11,12-didehydroandrographolide, CUR=curcumin, DMC=demethoxycurcumin, BDMC=bisdemethoxycurcumin, PIP=piperine, ABA=α-boswellic acid, AABA=3-*O*-acetyl-α-boswellic acid, BBA=β-boswellic acid, ABBA=3-*O*-acetyl-β-boswellic acid, KBA=11-keto-β-boswellic acid, AKBA=3-*O*-acetyl-11-keto-β-boswellic acid

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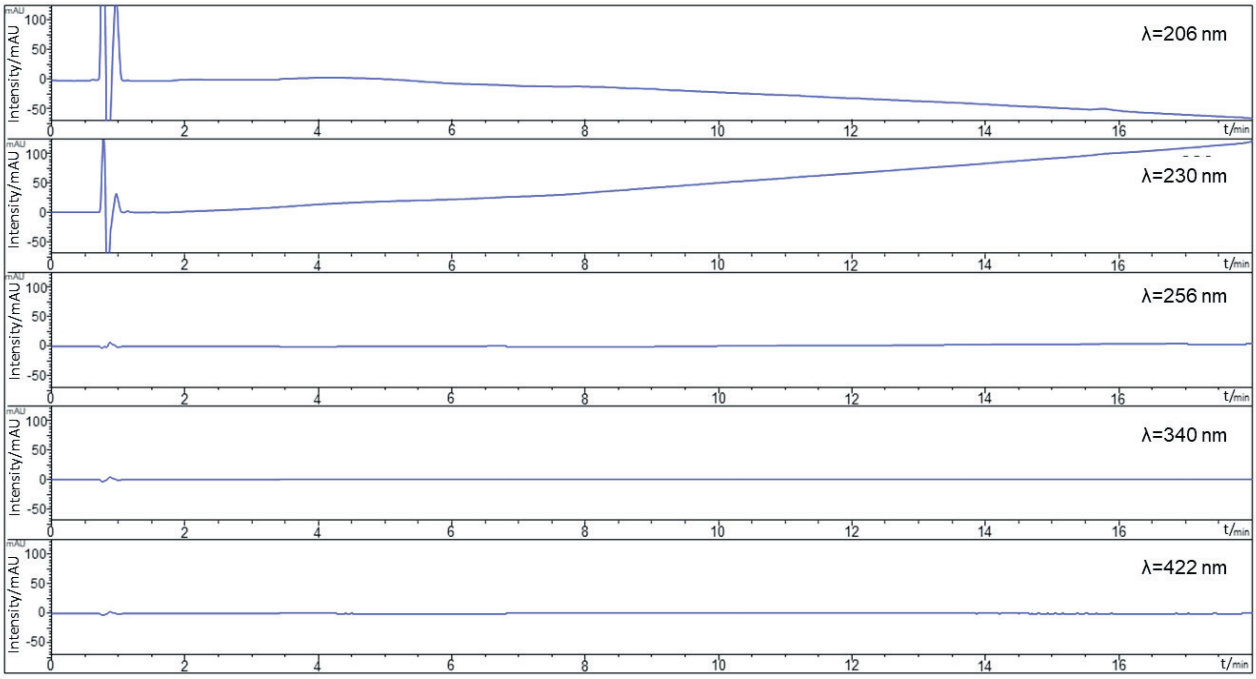


**Fig. S2.** Chromatogram of the excipient solution

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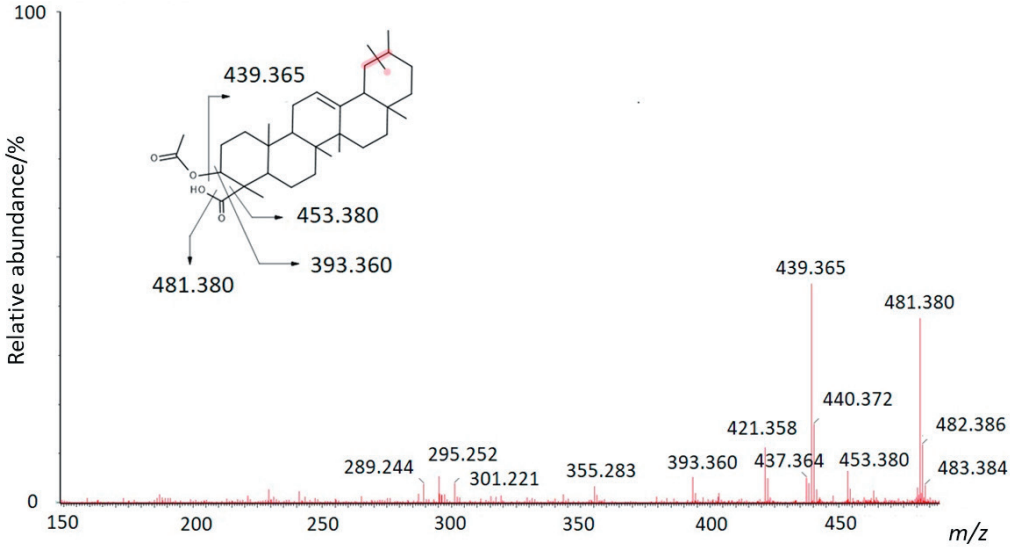


**Fig. S3.** Representative MS/MS spectrum (precursor *m/z*=499.4) of a peak at 15.32 min. Inset: proposed fragmentation pattern of acetylated boswellic acids

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**Table S1.** List of analyzed samples

| Code | Purchased from | Manufacturer location | Matrix | Sample type | Description/label (per dosage form, unless specified otherwise) |
|---|---|---|---|---|---|
| S1 | online supplier | Kakheri, India | dry extract | hard capsules | turmeric (standardized to min. 90 % curcuminoids), Indian frankincense (standardized to min. 65 % boswellic acids), black pepper fruit (standardized to min. 95 % piperine) |
| S2 | local pharmacy | Zagreb, Croatia | dry extract | hard capsules | turmeric extract (350 mg, standardized to 9 % curcuminoids), black pepper extract (5 mg, standardized to 95 % piperine) |
| S3 | local pharmacy | Zagreb, Croatia | soft extract | soft capsules | turmeric extract (containing 48 mg of curcuminoids, of which 40 mg curcumin), black pepper extract (10 mg), vitamin $D_3$ (3 µg) |
| S4 | local health store | Karlovac, Croatia | dry extract | hard capsules | mixture of turmeric dry extract and turmeric root oil (25:1) (standardized to 95 % curcuminoids) |
| S5 | local pharmacy | Karlovac, Croatia | dry extract | hard capsules | mixture of turmeric dry extract and turmeric root oil (25:1) (250 mg, standardized to 95 % curcuminoids), Indian frankincense extract (250 mg, standardized to 10 % AKB and 75 % boswellic acids) |
| S6 | online supplier | Loei, Thailand | dry extract | tablets | turmeric extract/black pepper extract (10:1) |
| S7 | local pharmacy | Baillonville, Belgium | soft extract | soft capsules | bio-optimized turmeric extract (standardized to 42 mg curcumin/ capsule) |
| S8 | local pharmacy | Milan, Italy | dry extract | hard capsules | turmeric extract (standardized to 95 % curcuminoids) |
| S9 | local pharmacy | Salzburg, Austria | dry extract | hard capsules | turmeric extract (528 mg, of which 500 mg curcuminoids), black pepper fruit extract (5.3 mg, of which 5 mg piperine) |
| S10 | local pharmacy | Leonia, NJ, USA | soft extract | soft capsules | turmeric extract (48 mg curcuminoids, of which 40 mg curcumin/ capsule) |
| S11 | local pharmacy | Zagreb, Croatia | dry extract | hard capsules | turmeric rhizome dry extract (450 mg, standardized to min. 95 % curcuminoids), black pepper fruit dry extract (10 mg, standardized to min. 95 % piperine), vitamin $B_6$ (0.7 mg), vitamin $B_{12}$ (1.25 µg), vitamin $D_3$ (2.5 µg), selenium (27.5 µg) |
| S12 | local pharmacy | Zagreb, Croatia | dry extract | hard capsules | turmeric rhizome dry extract (50 mg, standardized to min. 95 % curcuminoids), vitamin C (50 mg), frankincense resin dry extract (40 mg, standardized to min. 75 % boswellic acid, of which min. 30% AKBA), hyaluronic acid (15 mg), manganese (1 mg), black pepper dry extract (3 mg, standardized to min. 95 % piperine), vitamin $D_3$ (2.5 µg) |
| S13 | online supplier | not stated | dry extract | hard capsules | turmeric root extract powder (500 mg, standardized to 95 % curcuminoids), BioPerine black pepper extract powder (5 mg) |
| S14 | online supplier | Sonipat, India | dry extract | powder bulk | curcumin (200 mg, standardized to 95 % curcuminoids), frankincense extract (192 mg, standardized to 65 % boswellic acids), black pepper extract (8 mg, standardized to 95 % piperine) |
| S15 | local health store | Zagreb, Croatia | tincture | liquid | eco turmeric |
| S16 | online supplier | Ruen, Bulgaria | tincture | liquid | turmeric (900 mg/daily dose) |
| S17 | local pharmacy | Zagreb, Croatia | soft extract | soft capsules | curcumin (30 mg), vitamin $D_3$ (7 µg) |
| S18 | local health store | Leonia, NJ, USA | dry extract | tablets | turmeric root extract (25 mg, standardized to 93 % curcuminoids), vitamin B, vitamin C, vitamin E, iron, broccoli extract, tea extract |
| S19 | local health store | Dorset, UK | dry extract | tablets | turmeric extract (175 mg, standardized to 95 % curcuminoids) |
| S20 | online supplier | Park City, UT, USA | dry extract | tablets | Indian frankincense resin extract, turmeric root extract, glucosamine, chondroitin, methylsulfonylmethane, phenylalanine, bromelain, calcium, zinc, manganese, boron |
| S21 | online supplier | Sonipat, India | dry extract | powder bulk | standardized to min. 95 % piperine |
| S22 | online supplier | Sonipat, India | dry extract | powder bulk | min. 60 % boswellic acids |
| S23 | online supplier | Sonipat, India | dry extract | hard capsules | Indian frankincense resin extract (500 mg, standardized to min. 65 % boswellic acids) |
| S24 | online supplier | Rohtak, India | dry extract | hard capsules | Indian frankincense resin extract (500 mg, standardized to min. 75 % boswellic acids) |
| S25 | online supplier | London, UK | dry extract | hard capsules | Indian frankincense resin extract (482 mg, standardized to min. 65 % boswellic acids) |

**Table S1.** continued

| Code | Purchased from | Manufacturer location | Matrix | Sample type | Description/label (per dosage form, unless specified otherwise) |
|---|---|---|---|---|---|
| S26 | online supplier | Rohtak, India | dry extract | hard capsules | Indian frankincense resin extract (500 mg, standardized to min. 90 % boswellic acids) |
| S27 | local health store | Samobor, Croatia | dry extract | hard capsules | Indian frankincense resin extract (140 mg), balmtree extract (140 mg), bovine colostrum (70 mg) |
| S28 | local pharmacy | Zagreb, Croatia | dry extract | hard capsules | Indian frankincense resin extract (80 mg, min. 25 % boswellic acids), glucosamine, chondroitin, vitamin C, hyaluronic acid |
| S29 | local pharmacy | Boca Raton, FL, USA | dry extract | tablets | 5-LOXIN advanced AKBA (50 mg), glucosamine, vitamin C, manganese, boron, hyaluronic acid |
| S30 | online supplier | Rohtak, India | dry extract | hard capsules | standardized to min. 98 % andrographolides |
| S31 | online supplier | Rohtak, India | dry extract | hard capsules | green chiretta extract (50 mg, min. 90 % andrographolides), powdered green chiretta herb (350 mg) |
| S32 | online supplier | Indore, India | dry extract | hard capsules | green chiretta extract (600 mg, min. 2 % andrographolides), powdered green chiretta herb (200 mg) |
| S33 | online supplier | Hollywood, FL, USA | dry extract | hard capsules | proprietary blend (turmeric, green chiretta, Indian frankincense extracts, piperine, glucosamine, collagen, hyaluronic acid) |
| S34 | online supplier | Fort Lauderdale, FL, USA | dry extract | hard capsules | turmeric extract (250 mg, standardized to 40 % curcuminoids), PARACTIN® (150 mg, patented blend of andrographolides) |
| S35 | online supplier | Tampa, FL, USA | dry extract | hard capsules | green chiretta herb (25 mg), turmeric root extract (42 mg, standardized to 95 % curcuminoids), vitamins C and D, magnesium, selenium, zinc, elderberry fruit extract, olive leaf extract, kudzu root powder, N-acetylcysteine, garlic bulb powder, quercetin, oregano leaf powder |
| S36 | local pharmacy | Toronto, Canada | dry extract + processed botanical form | hard capsules | turmeric rhizome (500 mg), turmeric rhizome extract (50 mg, standardized to 95 % curcuminoids) |
| S37 | local health store | Zagreb, Croatia | processed botanical form | raw material | organically grown turmeric |
| S38 | local health store | Diepholz, Germany | processed botanical form | raw material | 100 % organically grown turmeric |
| S39 | local health store | Zagreb, Croatia | processed botanical form | raw material | ground turmeric rhizome |
| S40 | local health store | Zagreb, Croatia | processed botanical form | raw material | ground turmeric rhizome |
| S41 | local health store | AL Hoorn, the Netherlands | processed botanical form | hard capsules | turmeric root powder (200 mg), ginger root powder (160 mg), black pepper fruit extract (25 mg) |
| S42 | online supplier | Chiang Mai, Thailand | processed botanical form | hard capsules | *Curcuma longa* (450 mg), *Piper nigrum* (50 mg) |
| S43 | online supplier | Bangkok, Thailand | processed botanical form | hard capsules | turmeric powder |
| S44 | local health store | AL Hoorn, the Netherlands | processed botanical form | herbal tea | organically grown turmeric (49 %), verbena (31 %), lemon bark (15 %), black pepper (5 %) |
| S45 | local health store | Wolkersdorf, Austria | processed botanical form | raw material | ground turmeric |
| S46 | local health store | Virovitica, Croatia | processed botanical form | raw material | 100 % ground turmeric |
| S47 | local health store | Pfaffenhofen, Germany | processed botanical form | tablets | turmeric root, black pepper fruit |
| S48 | local health store | Zagreb, Croatia | processed botanical form | powder bulk | ground turmeric rhizome |
| S49 | online supplier | Patras, Greece | botanical product | raw material | Indian frankincense resin |
| S50 | online supplier | Turkey | botanical product | raw material | Indian frankincense resin |
| S51 | online supplier | not stated | botanical product | raw material | Indian frankincense resin |
| S52 | online supplier | Sonipat, India | processed botanical form | powder bulk | green chiretta herb |
| S53 | online supplier | Rohtak, India | processed botanical form | powder bulk | green chiretta herb |
| S54 | online supplier | Bangkok, Thailand | processed botanical form | hard capsules | green chiretta herb (500 mg, min. 6 % andrographolides) |

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**Table S2.** Results of selectivity testing by slope comparison

| Analyte | Slope (direct calibration) *N*=5 | Slope (standard addition) *N*=5 | Standard error of slope (direct calibration) | Standard error of slope (standard addition) | Correlation coefficient (direct calibration) | Correlation coefficient (standard addition) | *t*-value ($t_{critical}$=2.447) | p-value |
|---|---|---|---|---|---|---|---|---|
| ANDR | 9.80 | 9.53 | 0.09 | 0.13 | 0.9999 | 0.9997 | 1.690 | 0.141 |
| NANDR | 7.42 | 7.17 | 0.07 | 0.09 | 0.9999 | 0.9997 | 2.166 | 0.073 |
| 14-DANDR | 7.39 | 7.27 | 0.10 | 0.13 | 0.9997 | 0.9995 | 0.695 | 0.513 |
| PIP | 31.59 | 31.92 | 0.44 | 0.71 | 0.9997 | 0.9993 | 0.391 | 0.709 |
| BDMC | 28.10 | 27.46 | 0.52 | 0.65 | 0.9999 | 0.9996 | 1.242 | 0.260 |
| DMC | 39.05 | 37.70 | 0.34 | 0.53 | 0.9999 | 0.9997 | 2.154 | 0.075 |
| CUR | 37.69 | 36.63 | 0.31 | 0.49 | 0.9999 | 0.9937 | 1.835 | 0.116 |
| KBA | 6.46 | 6.06 | 0.06 | 0.39 | 0.9999 | 0.9997 | 1.003 | 0.355 |
| AKBA | 6.51 | 6.31 | 0.06 | 0.09 | 0.9999 | 0.9997 | 1.804 | 0.121 |
| ABA | 2.71 | 2.57 | 0.02 | 0.16 | 0.9999 | 0.9944 | 0.874 | 0.416 |
| BBA | 2.70 | 2.76 | 0.05 | 0.04 | 0.9995 | 0.9997 | 0.930 | 0.388 |

ANDR=andrographolide, NANDR=neoandrographolide, 14-DANDR=14-deoxy-11,12-didehydroandrographolide, PIP=piperine, BDMC=bisdemethoxycurcumin, DMC=demethoxycurcumin, CUR=curcumin, KBA=11-keto-β-boswellic acid, AKBA=3-*O*-acetyl-11-keto-β--boswellic acid, ABA=α-boswellic acid, BBA=β-boswellic acid

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**Table S3.** Plackett-Burman design of robustness testing

| Standard | A sonication time/min | B dummy factor 1 | C extraction tempera-ture/°C | D dummy factor 2 | E ethanol ratio in extraction solvent/% | F dummy factor 3 | G mobile phase flow/ (mL/min) | H column tempera-ture/ °C | I dummy factor 4 | J detection wavelength change/ nm[a] | K gradient change/%[a] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 27 | –1 | 55 | –1 | 77.5 | –1 | 0.95 | 38.0 | –1 | –2 | –1 |
| 1 | 33 | –1 | 65 | –1 | 77.5 | 1 | 1.05 | 42.0 | –1 | 2 | –1 |
| 8 | 33 | 1 | 65 | 1 | 77.5 | –1 | 0.95 | 38.0 | 1 | 2 | –1 |
| 16 | 30 | 0 | 60 | 0 | 81.5 | 0 | 1.00 | 40.0 | 0 | 0 | 0 |
| 3 | 33 | 1 | 55 | –1 | 85.5 | –1 | 1.05 | 38.0 | –1 | 2 | 1 |
| 7 | 33 | 1 | 55 | –1 | 77.5 | 1 | 0.95 | 42.0 | 1 | –2 | 1 |
| 9 | 33 | –1 | 65 | 1 | 85.5 | 1 | 0.95 | 38.0 | –1 | –2 | 1 |
| 6 | 27 | –1 | 55 | 1 | 77.5 | 1 | 1.05 | 38.0 | 1 | 2 | 1 |
| 5 | 27 | 1 | 55 | 1 | 85.5 | 1 | 0.95 | 42.0 | –1 | 2 | –1 |
| 2 | 27 | –1 | 65 | –1 | 85.5 | –1 | 0.95 | 42.0 | 1 | 2 | 1 |
| 13 | 30 | 0 | 60 | 0 | 81.5 | 0 | 1.00 | 40.0 | 0 | 0 | 0 |
| 10 | 27 | 1 | 65 | –1 | 85.5 | 1 | 1.05 | 38.0 | 1 | –2 | –1 |
| 11 | 33 | –1 | 55 | 1 | 85.5 | –1 | 1.05 | 42.0 | 1 | –2 | –1 |
| 4 | 27 | 1 | 65 | 1 | 77.5 | –1 | 1.05 | 42.0 | –1 | –2 | 1 |
| 14 | 30 | 0 | 60 | 0 | 81.5 | 0 | 1.00 | 40.0 | 0 | 0 | 0 |
| 15 | 30 | 0 | 60 | 0 | 81.5 | 0 | 1.00 | 40.0 | 0 | 0 | 0 |

[a]Change (nm or percentage of acetonitrile in mobile phase) in relation to standard method conditions, *i.e.* designated wavelengths and gradient program

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**Table S4.** Responses of yield of analytes in mixtures and resolution of chromatographic peaks ($R_s$) in robustness testing

| Standard | *Y*(analyte)/(mg/g) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | ANDR | NANDR | 14-DANDR | PIP | BDMC | DMC | CUR | KBA | AKBA | ABA | BBA |
| 12 | 7.73 | 1.13 | 3.18 | 6.88 | 1.92 | 1.47 | 3.59 | 0.44 | 3.94 | 8.29 | 30.07 |
| 1 | 6.86 | 0.75 | 2.78 | 6.72 | 1.75 | 1.39 | 3.43 | 0.36 | 3.26 | 4.93 | 19.07 |
| 8 | 7.11 | 0.87 | 2.88 | 6.77 | 1.73 | 1.45 | 3.62 | 0.42 | 3.68 | 6.11 | 21.09 |
| 16 | 7.33 | 1.06 | 2.93 | 6.98 | 1.87 | 1.44 | 3.55 | 0.40 | 3.53 | 6.12 | 23.58 |
| 3 | 6.77 | 0.72 | 2.65 | 6.27 | 1.63 | 1.33 | 3.40 | 0.36 | 3.29 | 5.31 | 19.17 |
| 7 | 7.81 | 1.06 | 3.16 | 6.88 | 1.91 | 1.44 | 3.52 | 0.44 | 3.94 | 7.66 | 30.46 |
| 9 | 7.69 | 0.98 | 3.12 | 6.54 | 1.77 | 1.43 | 3.58 | 0.43 | 3.96 | 8.45 | 30.52 |
| 6 | 6.53 | 0.68 | 2.60 | 5.89 | 1.73 | 1.31 | 3.26 | 0.35 | 3.14 | 5.05 | 18.40 |
| 5 | 7.14 | 0.83 | 2.94 | 6.97 | 1.83 | 1.43 | 3.53 | 0.39 | 3.59 | 5.53 | 21.23 |
| 2 | 7.40 | 0.86 | 3.05 | 6.93 | 1.75 | 1.40 | 3.53 | 0.39 | 3.59 | 5.49 | 21.07 |
| 13 | 7.28 | 1.00 | 2.93 | 6.85 | 1.80 | 1.41 | 3.48 | 0.38 | 3.53 | 6.05 | 23.50 |
| 10 | 6.80 | 0.89 | 2.82 | 6.27 | 1.69 | 1.33 | 3.25 | 0.40 | 3.55 | 7.32 | 27.56 |
| 11 | 6.75 | 0.82 | 2.75 | 6.05 | 1.72 | 1.31 | 3.15 | 0.38 | 3.48 | 6.89 | 27.46 |
| 4 | 7.08 | 0.73 | 2.93 | 6.23 | 1.77 | 1.32 | 3.22 | 0.40 | 3.54 | 6.94 | 27.74 |
| 14 | 7.23 | 0.97 | 2.92 | 6.92 | 1.85 | 1.41 | 3.48 | 0.39 | 3.59 | 6.20 | 24.09 |
| 15 | 7.14 | 0.93 | 2.84 | 6.80 | 1.71 | 1.37 | 3.38 | 0.40 | 3.56 | 6.10 | 23.53 |
| Standard | $R_s$ | | | | | | | | | | |
| | ANDR | NANDR | 14-DANDR | PIP | BDMC | DMC | CUR | KBA | AKBA | ABA | BBA |
| 12 | 2.31 | 4.52 | 5.08 | 2.38 | 3.69 | 1.95 | 1.95 | 1.27 | 1.74 | 2.54 | 0.97 |
| 1 | 2.51 | 3.83 | 4.56 | 2.34 | 3.42 | 2.11 | 2.11 | 2.52 | 1.91 | 2.35 | 0.79 |
| 8 | 2.42 | 4.52 | 5.11 | 2.37 | 4.74 | 1.94 | 1.94 | 1.31 | 1.72 | 2.52 | 0.97 |
| 16 | 1.54 | 3.81 | 4.65 | 2.27 | 4.06 | 2.03 | 2.03 | 2.09 | 1.82 | 2.47 | 0.89 |
| 3 | 1.51 | 4.09 | 4.65 | 2.03 | 4.36 | 1.87 | 1.90 | 1.43 | 1.71 | 2.50 | 0.94 |
| 7 | 1.69 | 3.89 | 4.66 | 2.16 | 2.83 | 2.06 | 2.10 | 2.38 | 1.94 | 2.41 | 0.82 |
| 9 | 1.53 | 4.10 | 4.74 | 2.08 | 4.46 | 1.89 | 1.91 | 1.23 | 1.72 | 2.52 | 0.96 |
| 6 | 1.53 | 4.04 | 4.73 | 2.12 | 2.18 | 1.90 | 1.92 | 1.45 | 1.70 | 2.48 | 0.94 |
| 5 | 2.57 | 3.68 | 4.70 | 2.30 | 3.81 | 2.12 | 2.12 | 2.42 | 1.93 | 2.42 | 0.82 |
| 2 | 1.61 | 3.98 | 4.45 | 2.08 | 3.78 | 2.04 | 2.07 | 2.35 | 1.92 | 2.41 | 0.82 |
| 13 | 1.27 | 3.79 | 4.67 | 2.26 | 4.56 | 2.03 | 2.03 | 2.10 | 1.82 | 2.47 | 0.88 |
| 10 | 2.08 | 4.15 | 4.82 | 2.32 | 4.65 | 1.93 | 1.92 | 1.45 | 1.71 | 2.48 | 0.94 |
| 11 | 1.67 | 3.68 | 4.50 | 2.32 | 3.51 | 2.12 | 2.12 | 2.56 | 1.91 | 2.33 | 0.78 |
| 4 | 1.62 | 3.82 | 4.49 | 2.10 | 3.10 | 2.05 | 2.08 | 2.52 | 1.91 | 2.32 | 0.77 |
| 14 | 1.81 | 2.55 | 4.64 | 2.21 | 3.10 | 2.02 | 2.02 | 2.11 | 1.82 | 2.46 | 0.89 |
| 15 | 1.30 | 3.84 | 4.63 | 2.20 | 4.50 | 2.02 | 2.02 | 2.14 | 1.82 | 2.47 | 0.88 |

ANDR=andrographolide, NANDR=neoandrographolide, 14-DANDR=14-deoxy-11,12-didehydroandrographolide, PIP=piperine, BDMC=bisdemethoxycurcumin, DMC=demethoxycurcumin, CUR=curcumin, KBA=11-keto-β-boswellic acid, AKBA=3-*O*-acetyl-11-keto-β--boswellic acid, ABA=α-boswellic acid, BBA=β-boswellic acid

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**Table S5.** Factor effects and estimated $E_{critical}$ values

| Response | A sonication time/min | B dummy factor 1 | C extraction tempera-ture/°C | D dummy factor 2 | E ethanol ratio in extraction solvent/% | F dummy factor 3 | G mobile phase flow/ (mL/min) | H column tempera-ture/°C | I dummy factor 4 | J detection wave-length/ nm | K gradient change/% | $E_{critical}$ (α=0.05) | $E_{critical}$ (α=0.01) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Y*(analyte)/(mg/g) | | | | | | | | | | | | | |
| ANDR | 0.051 | −0.042 | −0.004 | −0.180 | −0.010 | −0.003 | −0.680 | 0.068 | −0.150 | −0.340 | 0.150 | 0.254 | 0.446 |
| NANDR | −0.012 | 0.005 | −0.006 | −0.060 | −0.043 | −0.013 | −0.170 | −0.011 | −0.017 | −0.170 | −0.019 | 0.068 | 0.120 |
| 14-DANDR | −0.030 | −0.014 | 0.007 | −0.070 | −0.033 | −0.003 | −0.300 | 0.059 | −0.058 | −0.180 | 0.026 | 0.099 | 0.174 |
| PIP | 0.010 | 0.064 | 0.062 | −0.250 | −0.055 | 0.019 | −0.590 | 0.190 | −0.130 | 0.120 | −0.150 | 0.309 | 0.543 |
| BDMC | −0.032 | −0.013 | −0.014 | −0.017 | −0.072 | 0.027 | −0.110 | 0.042 | −0.022 | −0.061 | −0.012 | 0.044 | 0.077 |
| DMC | 0.016 | −0.002 | 0.003 | −0.019 | −0.025 | 0.007 | −0.100 | −0.005 | −0.023 | 0.003 | −0.025 | 0.033 | 0.058 |
| CUR | 0.052 | 0.001 | 0.013 | −0.057 | −0.037 | 0.011 | −0.270 | −0.054 | −0.070 | 0.079 | −0.010 | 0.097 | 0.170 |
| KBA | 0.005 | 0.011 | 0.008 | −0.004 | −0.009 | −0.003 | −0.042 | −0.006 | −0.001 | −0.040 | −0.004 | 0.013 | 0.023 |
| AKBA | 0.043 | 0.038 | 0.027 | −0.029 | −0.004 | −0.013 | −0.410 | −0.028 | −0.032 | −0.310 | −0.007 | 0.063 | 0.110 |
| ABA | 0.120 | −0.036 | 0.078 | −0.005 | −0.001 | −0.019 | −0.850 | −0.520 | −0.160 | −2.190 | −0.030 | 0.176 | 0.309 |
| BBA | 0.290 | 0.110 | 0.120 | −0.160 | 0.027 | 0.110 | −2.510 | 0.039 | −0.290 | −8.970 | 0.150 | 0.390 | 0.686 |
| $R_s$ | | | | | | | | | | | | | |
| ANDR | −0.065 | 0.120 | 0.160 | −0.062 | −0.190 | 0.130 | −0.200 | 0.048 | −0.180 | 0.210 | −0.680 | 0.277 | 0.487 |
| NANDR | −0.013 | 0 | −0.140 | −0.100 | −0.160 | −0.150 | −0.180 | −0.420 | 0.037 | −0.003 | −0.077 | 0.196 | 0.345 |
| 14-DANDR | −0.008 | 0.062 | −0.025 | 0.008 | −0.013 | −0.012 | −0.160 | −0.300 | 0.008 | −0.015 | −0.180 | 0.068 | 0.120 |
| PIP | 0 | −0.007 | −0.016 | −0.003 | −0.006 | 0.007 | −0.023 | 0 | 0.023 | −0.020 | −0.240 | 0.027 | 0.047 |
| BDMC | 0.350 | 0.410 | −0.020 | −0.160 | 0.770 | −0.300 | −0.350 | −0.600 | −0.190 | 0.008 | −0.520 | 0.602 | 1.509 |
| DMC | 0 | −0.007 | −0.007 | 0.010 | −0.007 | 0.007 | −0.003 | 0.170 | 0 | −0.003 | −0.060 | 0.015 | 0.026 |
| CUR | 0.003 | −0.003 | −0.009 | 0.007 | −0.009 | 0.003 | −0.007 | 0.180 | 0 | −0.003 | −0.030 | 0.009 | 0.016 |
| KBA | −0.005 | 0.022 | −0.004 | 0.015 | −0.002 | 0.002 | 0.160 | 1.100 | 0.018 | 0.012 | −0.028 | 0.034 | 0.060 |
| AKBA | 0 | 0.003 | −0.003 | −0.007 | −0.003 | 0 | −0.200 | 0.200 | −0.003 | −0.007 | −0.003 | 0.009 | 0.015 |
| ABA | −0.003 | 0.003 | −0.007 | −0.017 | 0.007 | 0.007 | −0.060 | −0.130 | −0.003 | 0.013 | 0 | 0.020 | 0.035 |
| BBA | 0 | 0 | 0.001 | −0.007 | 0 | 0.003 | −0.033 | −0.150 | 0.003 | 0.007 | −0.003 | 0.009 | 0.015 |

$R_s$=resolution of chromatographic peaks, $E_{critical}$=critical effect for a response, ANDR=andrographolide, NANDR=neoandrographolide, 14-DANDR=14-deoxy-11,12-didehydroandrographolide, PIP=piperine, BDMC=bisdemethoxycurcumin, DMC=demethoxycurcumin, CUR=curcumin, KBA=11-keto-β-boswellic acid, AKBA=3-*O*-acetyl-11-keto-β-boswellic acid, ABA=α-boswellic acid, BBA=β-boswellic acid

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**Table S6.** Factor effects for each response

| Response | Significant factors (α=0.05) from comparison with critical effects from negligible effects | Significant factors (α=0.01) from comparison with critical effects from negligible effects | Significant factors from Pareto chart (above the Bonferroni limit, α=0.05) | Important factors from half-normal probability plot |
|---|---|---|---|---|
| *Y*(analyte)/(mg/g) | | | | |
| ANDR | G+J | G | G+J | G+J |
| NANDR | G+J | G+J | G+J | D+E+G+J |
| 14-DANDR | G+J | G+J | G+J | G+J |
| PIP | G | G | D+G | G |
| BDMC | E+G+J | G | / | G |
| DMC | G | G | / | G |
| CUR | G | G | G | G |
| KBA | G+J | G+J | B+C+E+G+H+J | G+J |
| AKBA | G+J | G+J | G+J | G+J |
| ABA | G+H+J | G+H+J | A+G+H+I+J | G+H+J |
| BBA | G+J | G+J | G+J | G+J |
| $R_s$ | | | | |
| ANDR | K | K | K | K |
| NANDR | H | H | / | / |
| 14-DANDR | G+H+K | G+H+K | B+E+G+H+K | B+E+G+H+K |
| PIP | K | K | E+K | E+K |
| BDMC | E | / | / | / |
| DMC | H+K | H+K | H+K | H+K |
| CUR | H+K | H+K | H+K | H+K |
| KBA | G+H | G+H | G+H | G+H |
| AKBA | G+H | G+H | G+H | G+H |
| ABA | G+H | G+H | D+G+H | G+H |
| BBA | G+H | G+H | G+H | G+H |

$R_s$=resolution of chromatographic peaks, ANDR=andrographolide, NANDR=neoandrographolide, 14-DANDR=14-deoxy-11,12-didehydroandrographolide, PIP=piperine, BDMC=bisdemethoxycurcumin, DMC=demethoxycurcumin, CUR=curcumin, KBA=11-keto-β--boswellic acid, AKBA=3-*O*-acetyl-11-keto-β-boswellic acid, ABA=α-boswellic acid, BBA=β-boswellic acid

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**Table S7.** Non-significant intervals for significant factors of selected responses

| Response | Factor | Non-significant interval |
|---|---|---|
| *Y*(analyte)/(mg/g) | | |
| ANDR | G | 0.981–1.019 |
| | J | −1.5–1.5 |
| NANDR | G | 0.980–1.020 |
| | J | −0.8–0.8 |
| 14-DANDR | G | 0.983–1.017 |
| | J | −1.1–1.1 |
| PIP | G | 0.974–1.026 |
| BDMC | G | 0.980–1.020 |
| DMC | G | 0.983–1.017 |
| CUR | G | 0.982–1.018 |
| KBA | G | 0.985–1.015 |
| | J | −0.7–0.7 |
| AKBA | G | 0.992–1.008 |
| | J | −0.4–0.4 |
| ABA | G | 0.990–1.010 |
| | H | 39.32–40.68 |
| | J | −0.2–0.2 |
| BBA | G | 0.992–1.008 |
| | J | −0.09–0.09 |

| Response | Factor | Non-significant interval |
|---|---|---|
| $R_s$ | | |
| ANDR | K | −0.41–0.41 |
| NANDR | H | 39.07–40.93 |
| 14-DANDR | G | 0.980–1.020 |
| | H | 39.55–40.45 |
| | K | −0.38–0.38 |
| PIP | K | −0.11–0.11 |
| DMC | H | 39.82–40.18 |
| | K | −0.25–0.25 |
| CUR | H | 39.90–40.10 |
| | K | −0.30–0.30 |
| KBA | G | 0.990–1.010 |
| | H | 39.94–40.06 |
| AKBA | G | 0.980–1.020 |
| | H | 39.91–40.09 |
| ABA | G | 0.983–1.017 |
| | H | 39.69–40.31 |
| BBA | G | 0.986–1.014 |
| | H | 39.88–40.12 |

$R_s$=resolution of chromatographic peaks, ANDR=andrographolide, NANDR=neoandrographolide, 14-DANDR=14-deoxy-11,12-didehydroandrographolide, PIP=piperine, BDMC=bisdemethoxycurcumin, DMC=demethoxycurcumin, CUR=curcumin, KBA=11-keto-β--boswellic acid, AKBA=3-*O*-acetyl-11-keto-β-boswellic acid, ABA=α-boswellic acid, BBA=β-boswellic acid